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(71) Applicant *(for all designated States except US)*: **SCHERING CORPORATION** [US/US]; Patent Department K-6-1 1990, 2000 Galloping Hill Road, Kenilworth, New Jersey 07033 (US).

(72) Inventors; and
(75) Inventors/Applicants *(for US only)*: **WANG, Yan** [US/US]; 73 Clydesdale Road, Scotch Plains, New Jersey 07076 (US). **PACHTER, Jonathan** [US/US]; 12 Overlook Way, Setauket, New York 11733 (US). **WANG, Yaolin** [US/US]; 217 West Sherman Avenue, Edison, New Jersey 08820 (US). **LIU, Ming** [US/US]; 103 Pleasant Avenue, Fanwood, New Jersey 07023 (US).

(74) Agent: **TRIOLO, Thomas**; Schering-Plough Corporation, 2000 Galloping Hill Road, Mailstop K-6-1 1990, Kenilworth, New Jersey 07033 (US).

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(54) Title: BIOMARKERS FOR PRE-SELECTION OF PATIENTS FOR ANTI-IGF1R THERAPY

(57) Abstract: The present invention provides methods for identifying patients whose cancers are likely to be responsive to IGF1R inhibitory anti-cancer therapy along with methods for treating such patients. Patients identified by a method of the present invention can be treated with any of several known IGF1R inhibitory agents including antibodies, small molecule inhibitors and anti-sense nucleic acids.

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BIOMARKERS FOR PRE-SELECTION OF PATIENTS FOR ANTI-IGF1R THERAPY

The present application claims the benefit of U.S. provisional patent application no. 60/633,156; filed December 3, 2004, which is herein incorporated by reference in its entirety.

Field of the Invention

The present invention relates to methods for selecting patients for anti-cancer therapy.

Background of the Invention

The insulin-like growth factors, also known as somatomedins, include insulin-like growth factor-I (IGF-I) and insulin-like growth factor-II (IGF-II) (Klapper, *et al.*, (1983) Endocrinol. 112:2215 and Rinderknecht, *et al.*, (1978) Febs.Lett. 89:283). These growth factors exert mitogenic activity on various cell types, including tumor cells (Macaulay, (1992) Br. J. Cancer 65:311), by binding to a common receptor named the insulin-like growth factor receptor-1 (IGF1R) (Sepp-Lorenzino, (1998) Breast Cancer Research and Treatment 47:235). Interaction of IGFs with IGF1R activates the receptor by triggering autophosphorylation of the receptor on tyrosine residues (Butler, *et al.*, (1998) Comparative Biochemistry and Physiology 121:19). Once activated, IGF1R, in turn, phosphorylates intracellular targets to activate cellular signaling pathways. This receptor activation is critical for stimulation of tumor cell growth and survival. Therefore, inhibition of IGF1R activity represents a valuable potential method to treat or prevent growth of human cancers and other proliferative diseases.

Several lines of evidence indicate that IGF-I, IGF-II and their receptor IGF1R are important mediators of the malignant phenotype. Plasma levels of IGF-I have been found to be the strongest predictor of prostate cancer risk (Chan, *et al.*, (1998) Science 279:563) and similar epidemiological studies strongly link plasma IGF-I levels with breast, colon and lung cancer risk.

Overexpression of Insulin-like Growth Factor Receptor-I has also been demonstrated in several cancer cell lines and tumor tissues. IGF1R is overexpressed in 40% of all breast cancer cell lines (Pandini, *et al.*, (1999) Cancer Res. 5:1935) and in 15% of lung cancer cell lines. In breast cancer tumor tissue, IGF1R is overexpressed 6-14 fold and IGF1R exhibits 2-4 fold higher kinase activity as compared to normal tissue (Webster, *et al.*, (1996) Cancer Res. 56:2781 and Pekonen, *et al.*, (1998) Cancer Res. 48:1343).

Ninety percent of colorectal cancer tissue biopsies exhibit elevated IGF1R levels wherein the extent of IGF1R expression is correlated with the severity of the disease. Analysis of primary cervical cancer cell cultures and cervical cancer cell lines revealed 3- and 5-fold overexpression of IGF1R, respectively, as compared to normal ectocervical cells (Steller, *et al.,* (1996) Cancer Res. 56:1762). Expression of IGF1R in synovial sarcoma cells also correlated with an aggressive phenotype (*i.e.*, metastasis and high rate of proliferation; Xie, *et al.,* (1999) Cancer Res. 59:3588).

Currently, there are several known anti-cancer therapies that target IGF1R. For example, anti-IGF1R antibodies are owned by Schering Corp (see WO 2003/100008); Pfizer (see WO 2002/53596 or WO 2004/71529); Pierre Fabre medicament (see WO 2003/59951), Pharmacia Corp. (see WO 2004/83248), Immunogen, Inc. (see WO 2003/106621), Hoffman La Roche (see WO 2004/87756) and Imclone Systems Inc. (IMC-A12; see Burtrum *et. al* Cancer Research 63:8912-8921(2003)). Additionally, Novartis owns a small molecule IGFR inhibitor, NVP-ADW-742 (see WO 2002/92599) as does Biotech Research Ventures PTE Ltd (see WO 2003/39538). Antisense Therapeutics Ltd. also owns an anti-sense therapy that inhibits IGF1R expression, ATL-1101.

Agents that decrease IGF1R function and/or expression are effective in the treatment of some cancer patients. However, it is expected that a portion of cancer patients may not respond to such treatments. Therefore, a need exists in the art for a method to identify specific cancer populations and/or specific cancer patients who are most likely to respond to one or more anti-cancer therapies that target IGF1R.

Summary of the Invention

The present invention provides, *inter alia*, a method for treating cancers by pre-selecting patients whose tumors express appreciable levels of IGF-II and/or phosphorylated IRS-1 (insulin receptor substrate-1), thereby increasing the likelihood of a response, in the patient, to therapeutics targeting IGF1R.

The present invention provides a method for treating a tumor in a patient comprising (a) selecting a patient or patient population having a tumor known to express one or more of the following:

(i) IRS-1 phosphorylation on tyrosine 896;
(ii) IRS-1 phosphorylation on tyrosine 612;
(iii) IRS-1 phosphorylation on any tyrosine;

(iv) IGF-II;

(v) IGF1R phosphorylation on any tyrosine; or

(vi) IGF1R; and

(b) administering to said patient a therapeutically effective amount of an IGF1R inhibitory agent.

The present invention comprises a method for treating a tumor in a patient comprising: (a) selecting a patient having a tumor expressing one or more of the following:

(i) IRS-1 phosphorylation on tyrosine 896;

(ii) IRS-1 phosphorylation on tyrosine 612;

(iii) IRS-1 phosphorylation on any tyrosine;

(iv) IGF-II;

(v) IGF1R phosphorylation on any tyrosine; or

(vi) IGF1R; and

(b) administering to said patient a therapeutically effective amount of an IGF1R inhibitory agent. In an embodiment of the invention, the cancer is selected from the group consisting of bladder cancer, Wilm's cancer, bone cancer, prostate cancer, lung cancer, non-small cell lung cancer (NSCLC), colon cancer, rectal cancer, colorectal cancer, endometrial cancer, multiple myeloma, estrogen receptor-positive breast cancer, estrogen receptor-negative breast cancer, cervical cancer, synovial sarcoma, ovarian cancer, pancreatic cancer, neuroblastoma, rhabdomyosarcoma, osteosarcoma and vasoactive intestinal peptide secreting tumors. In an embodiment of the invention, the agent is selected from the group consisting of an isolated antibody or antigen-binding fragment thereof that binds specifically to human IGF1R and is a member selected from the group consisting of: (i) an isolated antibody or antigen-binding fragment thereof that binds specifically to human IGF1R comprising one or more CDRs from a light chain variable region comprising amino acids 20-128 of SEQ ID NO: 8 and/or one or more CDRs from a heavy chain variable region comprising amino acids 20-137 of SEQ ID NO: 10; (ii) an isolated antibody or antigen-binding fragment thereof comprising one or more CDRs from a heavy chain immunoglobulin comprising the amino acid sequence of SEQ ID NO: 2, 4, 6, 8, 19-28, 35-38, 43, 45 or 73-98;

(iii) an isolated antibody or antigen-binding fragment thereof comprising one or more CDRs from a light chain immunoglobulin comprising the amino acid sequence of SEQ ID NO: 10, 12-18, 29-34, 39, 40, 41, 42, 44 or 58-72; and (iv) an isolated single-chain

antibody (scfv) comprising an amino acid sequence selected from the group consisting of SEQ ID NOs: 46-51; or

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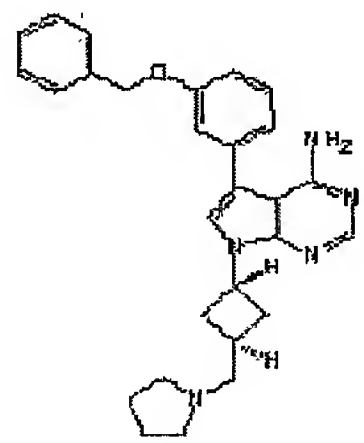
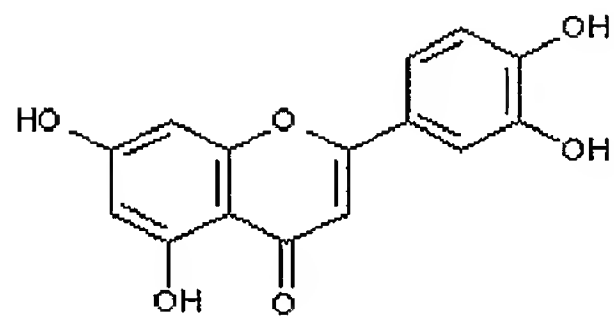
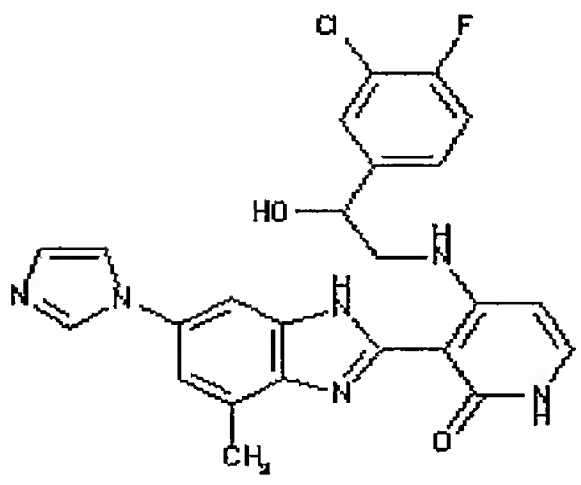






or ATL-1101. In an embodiment of the invention, the isolated antibody or antigen-binding fragment thereof comprises: (i) an isolated immunoglobulin heavy chain comprising an amino acid sequence selected from the group consisting of SEQ ID NOs: 2, 4, 6, 8, 19-28, 35-38, 43, 45 and 73-98; (ii) an isolated immunoglobulin light chain comprising an amino acid sequence selected from the group consisting of SEQ ID NOs: 10, 12-18, 29-34, 39, 40, 41, 42, 44 and 58-72; (iii) an isolated antibody produced by a hybridoma deposited at the American Type Culture Collection under deposit number PTA-2792, PTA-2788, PTA-2790, PTA-2791, PTA-2789 or PTA-2793; (iv) an isolated antibody or antigen-binding fragment thereof that binds specifically to human IGF1R comprising a light chain variable region comprising amino acids 20-128 of SEQ ID NO: 8 and/or a heavy chain variable region comprising amino acids 20-137 of SEQ ID NO: 10; and/or (v) an isolated antibody comprising an immunoglobulin light chain encoded by the plasmid contained in the cell line deposited at the American Type Culture Collection under deposit number PTA-5220 and an immunoglobulin heavy chain encoded by the plasmid contained in a cell line deposited at the American Type Culture Collection under deposit number PTA-5214 or PTA-5216. In an embodiment of the invention, phosphorylation of tyrosine on IRS-1 or IGF1R is determined by western blot analysis,

ELISA or flow cytometry analysis. In an embodiment of the invention, IGF-II expression is determined by western blot analysis, ELISA, quantitative PCR or by northern blot analysis. In an embodiment of the invention, IGF1R expression is determined by western blot analysis or ELISA.

The present invention provides a method for selecting a therapy for a patient or a patient population with a tumor, comprising: (a) determining whether the patient's tumor is known to express one or more of the following:

(i) IRS-1 phosphorylation on tyrosine 896;

(ii) IRS-1 phosphorylation on tyrosine 612;

(iii) IRS-1 phosphorylation on any tyrosine;

(iv) IGF-II;

(v) IGF1R phosphorylation on any tyrosine; or

(vi) IGF1R; and/or

(b) determining whether the patient's tumor expresses one or more of the following:

(i) IRS-1 phosphorylation on tyrosine 896;

(ii) IRS-1 phosphorylation on tyrosine 612;

(iii) IRS-1 phosphorylation on any tyrosine;

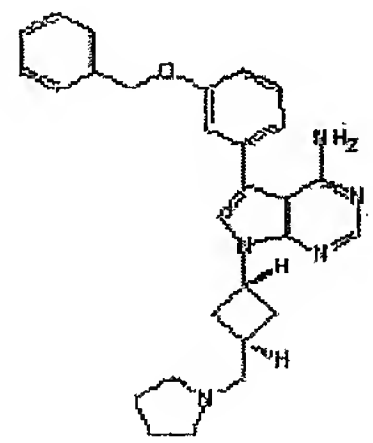
(iv) IGF-II;

(v) IGF1R phosphorylation on any tyrosine; or

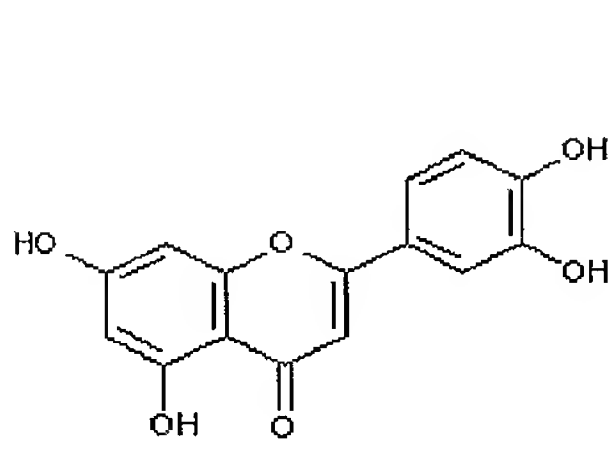
(vi) IGF1R; and

(c) selecting an IGF1R inhibitory agent as the therapy if the patient's tumor is known to express one or more of (i)-(vi) and/or if the patient's tumor expresses one or more of (i)-(vi). In an embodiment of the invention, the agent is selected from the group consisting of an isolated antibody or antigen-binding fragment thereof that binds specifically to human IGF1R and is a member selected from the group consisting of: (i) an isolated antibody or antigen-binding fragment thereof that binds specifically to human IGF1R comprising one or more CDRs from a light chain variable region comprising amino acids 20-128 of SEQ ID NO: 8 and/or a one or more CDRs from a heavy chain variable region comprising amino acids 20-137 of SEQ ID NO: 10; (ii) an isolated antibody or antigen-binding fragment thereof comprising one or more CDRs from a heavy chain immunoglobulin comprising the amino acid sequence of SEQ ID NO: 2, 4, 6, 8, 19-28, 35-38, 43, 45 or 73-98; (iii) an isolated antibody or antigen-binding fragment thereof comprising one or more CDRs from a light chain immunoglobulin comprising the amino acid sequence of SEQ ID NO: 10, 12-18, 29-34, 39, 40, 41, 42, 44 or 58-72; and (iv) an isolated single-chain

antibody (scfv) comprising an amino acid sequence selected from the group consisting of



SEQ ID NOs: 46-51; or (v)



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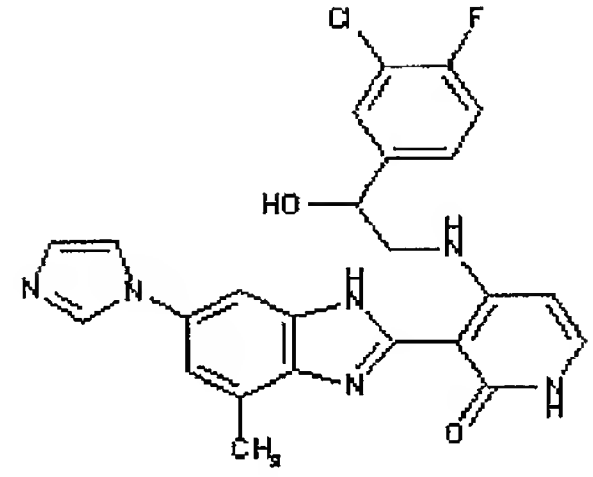


or ATL-1101.

In an embodiment of the invention, the isolated antibody or antigen-binding fragment thereof comprises: (i) an isolated immunoglobulin heavy chain comprising an amino acid sequence selected from the group consisting of SEQ ID NOs: 2, 4, 6, 8, 19-28, 35-38, 43, 45 and 73-98;(ii) an isolated immunoglobulin light chain comprising an amino acid sequence selected from the group consisting of SEQ ID NOs: 10, 12-18, 29-34, 39, 40, 41, 42, 44 and 58-72; (iii) an isolated antibody produced by a hybridoma deposited at the American Type Culture Collection under deposit number PTA-2792, PTA-2788, PTA-2790, PTA-2791, PTA-2789 or PTA-2793; (iv) an isolated antibody or antigen-binding fragment thereof that binds specifically to human IGF1R comprising a light chain variable region comprising amino acids 20-128 of SEQ ID NO: 8 and/or a heavy chain variable region comprising amino acids 20-137 of SEQ ID NO: 10; and/or (v) an isolated antibody comprising an immunoglobulin light chain encoded by the plasmid contained in the cell line deposited at the American Type Culture Collection under deposit number PTA-5220 and an immunoglobulin heavy chain encoded by the plasmid contained in a cell line deposited at the American Type Culture Collection under deposit number PTA-5214 or PTA-5216.

The present invention also provides a method for advertising an IGF1R inhibitory agent or a pharmaceutically acceptable composition thereof comprising promoting, to a

target audience, the use of the agent or pharmaceutical composition thereof for treating a patient or patient population whose tumors express or are known to express one or more of the following:

(i) IRS-1 phosphorylation on tyrosine 896;

(ii) IRS-1 phosphorylation on tyrosine 612;

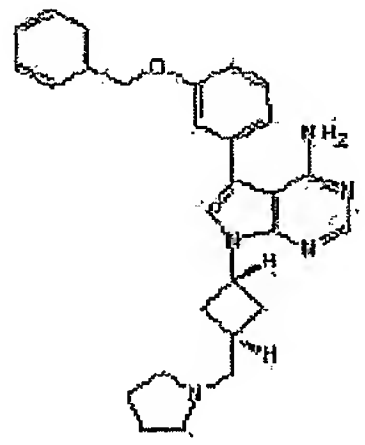
(iii) IRS-1 phosphorylation on any tyrosine;

(iv) IGF-II;

(v) IGF1R phosphorylation on any tyrosine; or

(vi) IGF1R.

In an embodiment of the invention, the agent is selected from the group consisting of an isolated antibody or antigen-binding fragment thereof that binds specifically to human IGF1R and is a member selected from the group consisting of: (i) an isolated antibody or antigen-binding fragment thereof that binds specifically to human IGF1R comprising one or more CDRs from a light chain variable region comprising amino acids 20-128 of SEQ ID NO: 8 and/or one or more CDRs from a heavy chain variable region comprising amino acids 20-137 of SEQ ID NO: 10; (ii) an isolated antibody or antigen-binding fragment thereof comprising one or more CDRs from a heavy chain immunoglobulin comprising the amino acid sequence of SEQ ID NO: 2, 4, 6, 8, 19-28, 35-38, 43, 45 or 73-98; (iii) an isolated antibody or antigen-binding fragment thereof comprising one or more CDRs from a light chain immunoglobulin comprising the amino acid sequence of SEQ ID NO: 10, 12-18, 29-34, 39, 40, 41, 42, 44 or 58-72; and (iv) an isolated single-chain antibody (scfv) comprising an amino acid sequence selected from the group consisting of SEQ ID NOs: 46-51; or (v)



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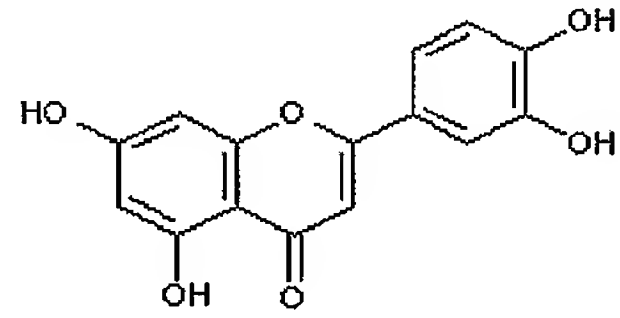

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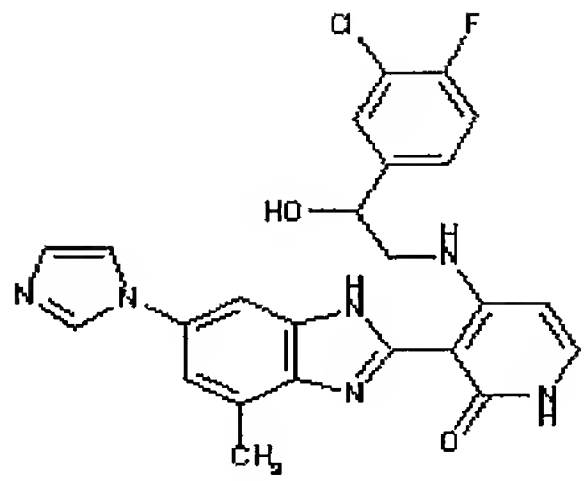


or ATL-1101. In an embodiment of the invention, the isolated antibody or antigen-binding fragment thereof comprises: (i) an isolated immunoglobulin heavy chain comprising an amino acid sequence selected from the group consisting of SEQ ID NOs: 2, 4, 6, 8, 19-28, 35-38, 43, 45 and 73-98; (ii) an isolated immunoglobulin light chain comprising an amino acid sequence selected from the group consisting of SEQ ID NOs: 10, 12-18, 29-34, 39, 40, 41, 42, 44 and 58-72; (iii) an isolated antibody produced by a hybridoma deposited at the American Type Culture Collection under deposit number PTA-2792, PTA-2788, PTA-2790, PTA-2791, PTA-2789 or PTA-2793; (iv) an isolated antibody or antigen-binding fragment thereof that binds specifically to human IGF1R comprising a light chain variable region comprising amino acids 20-128 of SEQ ID NO: 8 and/or a heavy chain variable region comprising amino acids 20-137 of SEQ ID NO: 10; and/or (v) an isolated antibody comprising an immunoglobulin light chain encoded by the plasmid contained in the cell line deposited at the American Type Culture Collection under deposit number PTA-5220 and an immunoglobulin heavy chain encoded by the plasmid contained in a cell line deposited at the American Type Culture Collection under deposit number PTA-5214 or PTA-5216.

The present invention also provides an article of manufacture comprising, packaged together, a pharmaceutical composition comprising an IGF1R inhibitory agent and a pharmaceutically acceptable carrier and a label stating that the agent or pharmaceutical composition is indicated for treating patients having a tumor expressing or known to express one or more of the following:

(i) IRS-1 phosphorylation on tyrosine 896;

(ii) IRS-1 phosphorylation on tyrosine 612;

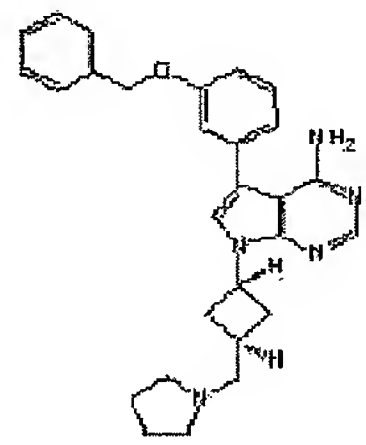
(iii) IRS-1 phosphorylation on any tyrosine;

(iv) IGF-II;

(v) IGF1R phosphorylation on any tyrosine; or

(vi) IGF1R.

In an embodiment of the invention, the agent is selected from the group consisting of an isolated antibody or antigen-binding fragment thereof that binds specifically to human IGF1R and is a member selected from the group consisting of: (i) an isolated antibody or antigen-binding fragment thereof that binds specifically to human IGF1R comprising one or more CDRs from a light chain variable region comprising amino acids 20-128 of SEQ ID NO: 8 and/or a one or more CDRs from a heavy chain variable region comprising amino acids 20-137 of SEQ ID NO: 10; (ii) an isolated antibody or antigen-binding fragment thereof comprising one or more CDRs from a heavy chain immunoglobulin comprising the amino acid sequence of SEQ ID NO: 2, 4, 6, 8, 19-28, 35-38, 43, 45 or 73-98; (iii) an isolated antibody or antigen-binding fragment thereof comprising one or more CDRs from a light chain immunoglobulin comprising the amino acid sequence of SEQ ID NO: 10, 12-18, 29-34, 39, 40, 41, 42, 44 or 58-72; and (iv) an isolated single-chain antibody (scfv) comprising an amino acid sequence selected from the group consisting of



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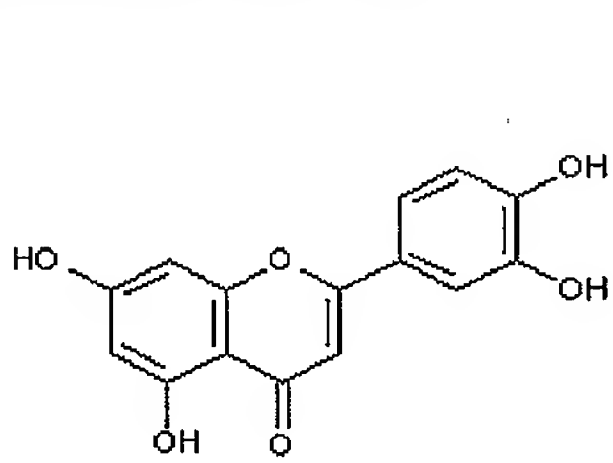

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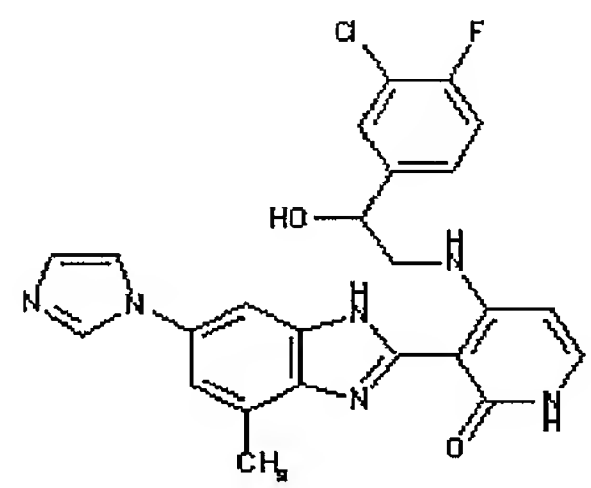


or ATL-1101.

In an embodiment of the invention, the isolated antibody or antigen-binding fragment thereof comprises: (i) an isolated immunoglobulin heavy chain comprising an amino acid sequence selected from the group consisting of SEQ ID NOs: 2, 4, 6, 8, 19-28, 35-38, 43, 45 and 73-98; (ii) an isolated immunoglobulin light chain comprising an amino acid sequence selected from the group consisting of SEQ ID NOs: 10, 12-18, 29-34, 39, 40, 41, 42, 44 and 58-72; (iii) an isolated antibody produced by a hybridoma deposited at the

American Type Culture Collection under deposit number PTA-2792, PTA-2788, PTA-2790, PTA-2791, PTA-2789 or PTA-2793; (iv) an isolated antibody or antigen-binding fragment thereof that binds specifically to human IGF1R comprising a light chain variable region comprising amino acids 20-128 of SEQ ID NO: 8 and/or a heavy chain variable region comprising amino acids 20-137 of SEQ ID NO: 10; and/or (v) an isolated antibody comprising an immunoglobulin light chain encoded by the plasmid contained in the cell line deposited at the American Type Culture Collection under deposit number PTA-5220 and an immunoglobulin heavy chain encoded by the plasmid contained in a cell line deposited at the American Type Culture Collection under deposit number PTA-5214 or PTA-5216.

The present invention further provides a method for manufacturing an IGF1R inhibitory agent or a pharmaceutical composition thereof comprising combining in a package the agent or pharmaceutical composition and a label stating that the agent or pharmaceutical composition is indicated for treating patients having a tumor expressing or known to express one or more of the following:

(i) IRS-1 phosphorylation on tyrosine 896;

(ii) IRS-1 phosphorylation on tyrosine 612;

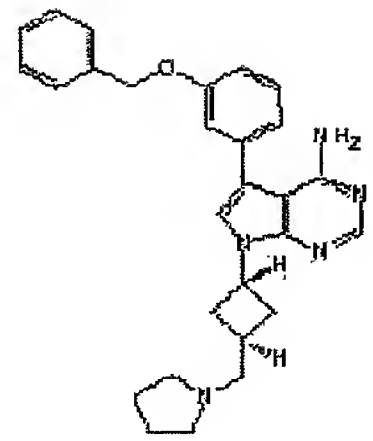
(iii) IRS-1 phosphorylation on any tyrosine;

(iv) IGF-II;

(v) IGF1R phosphorylation on any tyrosine; or

(vi) IGF1R.

In an embodiment of the invention, the agent is selected from the group consisting of an isolated antibody or antigen-binding fragment thereof that binds specifically to human IGF1R and is a member selected from the group consisting of: (i) an isolated antibody or antigen-binding fragment thereof that binds specifically to human IGF1R comprising one or more CDRs from a light chain variable region comprising amino acids 20-128 of SEQ ID NO: 8 and/or a one or more CDRs from a heavy chain variable region comprising amino acids 20-137 of SEQ ID NO: 10; (ii) an isolated antibody or antigen-binding fragment thereof comprising one or more CDRs from a heavy chain immunoglobulin comprising the amino acid sequence of SEQ ID NO: 2, 4, 6, 8, 19-28, 35-38, 43, 45 or 73-98; (iii) an isolated antibody or antigen-binding fragment thereof comprising one or more CDRs from a light chain immunoglobulin comprising the amino acid sequence of SEQ ID NO: 10, 12-18, 29-34, 39, 40, 41, 42, 44 or 58-72; and (iv) an isolated single-chain antibody (scfv) comprising an amino acid sequence selected from the group consisting of



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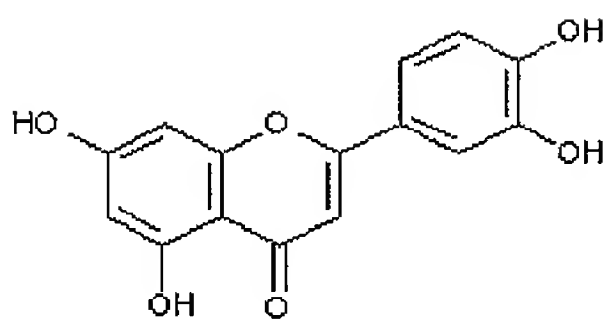

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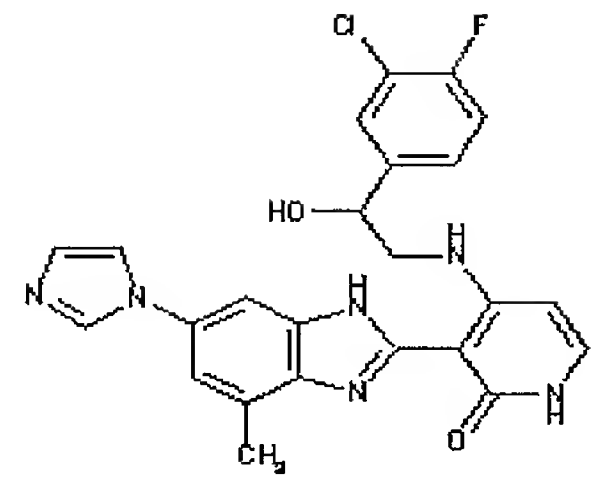


, or ATL-1101.

In an embodiment of the invention, the isolated antibody or antigen-binding fragment thereof comprises: (i) an isolated immunoglobulin heavy chain comprising an amino acid sequence selected from the group consisting of SEQ ID NOs: 2, 4, 6, 8, 19-28, 35-38, 43, 45 and 73-98; (ii) an isolated immunoglobulin light chain comprising an amino acid sequence selected from the group consisting of SEQ ID NOs: 10, 12-18, 29-34, 39, 40, 41, 42, 44 and 58-72; (iii) an isolated antibody produced by a hybridoma deposited at the American Type Culture Collection under deposit number PTA-2792, PTA-2788, PTA-2790, PTA-2791, PTA-2789 or PTA-2793; (iv) an isolated antibody or antigen-binding fragment thereof that binds specifically to human IGF1R comprising a light chain variable region comprising amino acids 20-128 of SEQ ID NO: 8 and/or a heavy chain variable region comprising amino acids 20-137 of SEQ ID NO: 10; and/or (v) an isolated antibody comprising an immunoglobulin light chain encoded by the plasmid contained in the cell line deposited at the American Type Culture Collection under deposit number PTA-5220 and an immunoglobulin heavy chain encoded by the plasmid contained in a cell line deposited at the American Type Culture Collection under deposit number PTA-5214 or PTA-5216.

The present invention also provides a method for identifying a patient whose tumor is likely to be responsive to an IGF1R inhibitory agent comprising: (a) determining whether the patient has a tumor known to express one or more of the following:

(i) IRS-1 phosphorylation on tyrosine 896;

(ii) IRS-1 phosphorylation on tyrosine 612;

(iii) IRS-1 phosphorylation on any tyrosine;

(iv) IGF-II;

(v) IGF1R phosphorylation on any tyrosine; or

(vi) IGF1R; and/or

(b) determining whether the patient has a tumor expressing one or more of the following:

(i) IRS-1 phosphorylation on tyrosine 896;

(ii) IRS-1 phosphorylation on tyrosine 612;

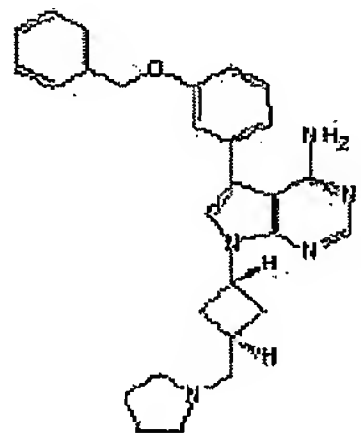
(iii) IRS-1 phosphorylation on any tyrosine;

(iv) IGF-II;

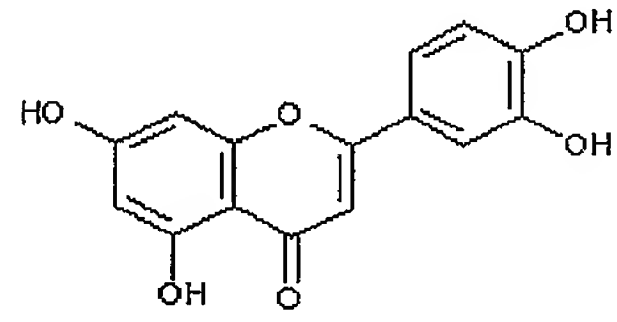
(v) IGF1R phosphorylation on any tyrosine; or

(vi) IGF1R.

In an embodiment of the invention, the agent is selected from the group consisting of an isolated antibody or antigen-binding fragment thereof that binds specifically to IGF1R and is a member selected from the group consisting of: (i) an isolated antibody or antigen-binding fragment thereof that binds specifically to human IGF1R comprising one or more CDRs from a light chain variable region comprising amino acids 20-128 of SEQ ID NO: 8 and/or a one or more CDRs from a heavy chain variable region comprising amino acids 20-137 of SEQ ID NO: 10; (ii) an isolated antibody or antigen-binding fragment thereof comprising one or more CDRs from a heavy chain immunoglobulin comprising the amino acid sequence of SEQ ID NO: 2, 4, 6, 8, 19-28, 35-38, 43, 45 or 73-98; (iii) an isolated antibody or antigen-binding fragment thereof comprising one or more CDRs from a light chain immunoglobulin comprising the amino acid sequence of SEQ ID NO: 10, 12-18, 29-34, 39, 40, 41, 42, 44 or 58-72; and (iv) an isolated single-chain antibody (scfv) comprising an amino acid sequence selected from the group consisting of SEQ ID NOs:

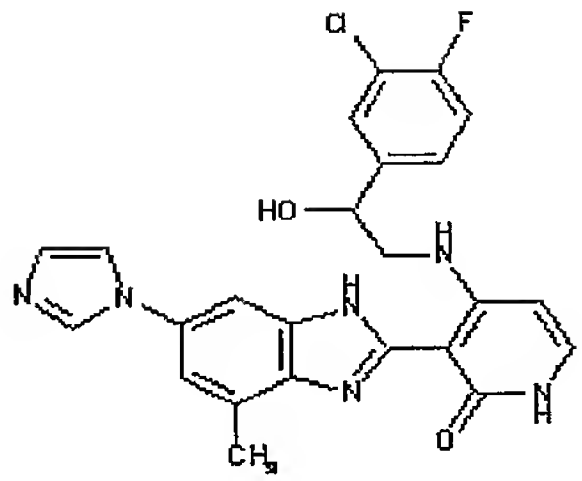


,



,

46-51; or (v)



or ATL-1101. In an embodiment of the invention, the isolated antibody or antigen-binding fragment thereof comprises: (i) an isolated immunoglobulin heavy chain comprising an amino acid sequence selected from the group consisting of SEQ ID NOs: 2, 4, 6, 8, 19-28, 35-38, 43, 45 and 73-98; (ii) an isolated immunoglobulin light chain comprising an amino acid sequence selected from the group consisting of SEQ ID NOs: 10, 12-18, 29-34, 39, 40, 41, 42, 44 and 58-72; (iii) an isolated antibody produced by a hybridoma deposited at the American Type Culture Collection under deposit number PTA-2792, PTA-2788, PTA-2790, PTA-2791, PTA-2789 or PTA-2793; (iv) an isolated antibody or antigen-binding fragment thereof that binds specifically to human IGF1R comprising a light chain variable region comprising amino acids 20-128 of SEQ ID NO: 8 and/or a heavy chain variable region comprising amino acids 20-137 of SEQ ID NO: 10; and/or (v) an isolated antibody comprising an immunoglobulin light chain encoded by the plasmid contained in the cell line deposited at the American Type Culture Collection under deposit number PTA-5220 and an immunoglobulin heavy chain encoded by the plasmid contained in a cell line deposited at the American Type Culture Collection under deposit number PTA-5214 or PTA-5216.

Brief Description of the Figures

Figure 1. IRS-1 Phosphorylation is Higher in Human Lung Tumor vs. Normal Tissue Samples. Western blot analysis results for normal and tumor tissue samples from four different patients. Lanes marked "T" contained tumor tissue and lanes marked "N" contained normal tissue.

Figure 2. Antibody 19D12/15H12 LCF/HCA: *In Vivo* Efficacy. The level of tumor growth inhibition observed in xenograft mice administered antibody 19D12/15H12 LCF/HCA is indicated along with the type of tumor evaluated and the cell line used to establish each tumor.

Figure 3. *In Vivo* Efficacy of 19D12/15H12 LCF/HCA Correlates with Sensitivity of IRS-1 Phosphorylation to IGF-I. In the "-" and "+" lanes, the quantity of phosphorylated

IRS-1, in each cell line evaluated, is shown in the absence and presence of IGF-I, respectively. The level of *in vivo* efficacy of 19D12/15H12 LCF/HCA at inhibiting growth of the indicated cell line (see figure 2) is also indicated.

Figure 4. Overexpression of *IGF-II* mRNA in Human Ovarian Tumor Samples. The normalized level of *IGF-II* mRNA expression observed in each of the 20 normal ovarian tissue samples and 36 cancerous ovarian tissue samples is shown.

Figure 5. Overexpression of *IGF-II* mRNA in Human Colorectal Tumor Samples. The normalized level of *IGF-II* mRNA expression observed in each of the 36 normal ovarian tissue samples and 36 cancerous colorectal tissue samples is shown.

Detailed Description of the Invention

The present invention provides a method for treating cancer or for identifying patients whose cancer is likely to be responsive to an IGF1R inhibitory agent. The method is useful, *inter alia*, for increasing the likelihood that administration of an IGF1R inhibitory anti-cancer therapy to a patient will be efficacious.

The terms "IGF1R", “IGFR1”, "Insulin-like Growth Factor Receptor-I" and "Insulin-like Growth Factor Receptor, type I" are well known in the art. Although IGF1R may be from any organism, it is preferably from an animal, more preferably from a mammal (*e.g.*, mouse, rat, rabbit, sheep or dog) and most preferably from a human. The nucleotide and amino acid sequence of a typical human IGF1R precursor has the Genbank Accession No. X04434 or NM_000875. Cleavage of the precursor (*e.g.*, between amino acids 710 and 711) produces an α-subunit and a β-subunit which associate to form a mature receptor.

The terms "IGF-I" "Insulin-like Growth Factor-I" and "Insulin-like Growth Factor, type I" are also well known in the art. The terms "IGF-II" "Insulin-like Growth Factor-II" and "Insulin-like Growth Factor, type II" are also well known in the art. Although IGF-I or IGF-II may be from any organism, they are preferably from an animal, more preferably from a mammal (*e.g.*, mouse, rat, rabbit, sheep or dog) and most preferably from a human. The nucleic acid and amino acid sequence of typical, human IGF-I and IGF-II have the Genbank Accession No. XM_052648 and NM_000612, respectively.

IGF1R inhibitory agents

The term “IGF1R inhibitory agent” includes any substance that decreases the expression, ligand binding, kinase activity or any other biological activity of IGF1R that will

elicit a biological or medical response of a tissue, system, subject or patient that is being sought by the administrator (such as a researcher, doctor or veterinarian) which includes any measurable alleviation of the signs, symptoms and/or clinical indicia of cancer (*e.g.*, tumor growth) and/or the prevention, slowing or halting of progression or metastasis of cancer to any degree.

In an embodiment of the invention, an IGF1R inhibitory agent that can be administered to a patient in a method according to the invention is any isolated anti-insulin-like growth factor receptor-1 (IGF1R) antibody or fragment thereof (e.g., monoclonal antibodies (*e.g.*, fully human monoclonal antibodies), polyclonal antibodies, bispecific antibodies, Fab antibody fragments, $F(ab)_2$ antibody fragments, Fv antibody fragments (*e.g.*, VH or VL), single chain Fv antibody fragments, dsFv antibody fragments, humanized antibodies, chimeric antibodies or anti-idiotypic antibodies) such as any of those disclosed in any of Burtrum *et. al* Cancer Research 63:8912-8921(2003); in French Patent Applications FR2834990, FR2834991 and FR2834900 and in PCT Application Publication Nos. WO 03/100008; WO 03/59951; WO 04/71529; WO 03/106621; WO 04/83248; WO 04/87756 and WO 02/53596.

In an embodiment of the invention, an IGF1R inhibitory agent that can be administered to a patient in a method according to the invention is an isolated anti-insulin-like growth factor receptor-1 (IGF1R) antibody comprising a mature or unprocessed 19D12/15H12 Light Chain-C, D, E or F and a mature 19D12/15H12 heavy chain-A or B. In an embodiment of the invention, an IGF1R inhibitory agent that can be administered to a patient in a method according to the invention is an isolated antibody that specifically binds to IGF1R that comprises one or more complementarity determining regions (CDRs) of 19D12/15H12 Light Chain-F and/or 19D12/15H12 heavy chain-A (*e.g.*, all 3 light chain CDRs and all 3 heavy chain CDRs).

The amino acid and nucleotide sequences of the 19D12/15H12 antibody chains are shown below. Dotted, underscored type indicates the signal peptide. Solid underscored type indicates the CDRs. Plain type indicates the framework regions. Mature fragments lack the signal peptide.

Modified 19D12/15H12 Light Chain-C (SEQ ID NO: 1)

ATG TCG CCA TCA CAA CTC ATT GGG TTT CTG CTG CTC TGG GTT CCA GCC TCC

AGG GGT GAA ATT GTG CTG ACT CAG AGC CCA GAC TCT CTG TCT GTG ACT CCA

GGC GAG AGA GTC ACC ATC ACC TGC CGG GCC AGT CAG AGC ATT GGT AGT AGC

TTA CAC TGG TAC CAG CAG AAA CCA GGT CAG TCT CCA AAG CTT CTC ATC AAG

TAT GCA TCC CAG TCC CTC TCA GGG GTC CCC TCG AGG TTC AGT GGC AGT GGA

TCT GGG ACA GAT TTC ACC CTC ACC ATC AGT AGC CTC GAG GCT GAA GAT GCT

GCA GCG TAT TAC TGT CAT CAG AGT AGT CGT TTA CCT CAC ACT TTC GGC CAA

GGG ACC AAG GTG GAG ATC AAA CGT ACG

(SEQ ID NO: 2)

M S P S Q L I G F L L L W V P A S

R G E I V L T Q S P D S L S V T P

G E R V T I T C R A S Q S I G S S

L H W Y Q Q K P G Q S P K L L I K

Y A S Q S L S G V P S R F S G S G

S G T D F T L T I S S L E A E D A

A A Y Y C H Q S S R L P H T F G Q

G T K V E I K R T

Modified 19D12/15H12 Light Chain-D (SEQ ID NO: 3)

ATG TCG CCA TCA CAA CTC ATT GGG TTT CTG CTG CTC TGG GTT CCA GCC TCC

AGG GGT GAA ATT GTG CTG ACT CAG AGC CCA GAC TCT CTG TCT GTG ACT CCA

GGC GAG AGA GTC ACC ATC ACC TGC CGG GCC AGT CAG AGC ATT GGT AGT AGC

TTA CAC TGG TAC CAG CAG AAA CCA GGT CAG TCT CCA AAG CTT CTC ATC AAG

TAT GCA TCC CAG TCC CTC TCA GGG GTC CCC TCG AGG TTC AGT GGC AGT GGA

TCT GGG ACA GAT TTC ACC CTC ACC ATC AGT AGC CTC GAG GCT GAA GAT TTC

GCA GTG TAT TAC TGT CAT CAG AGT AGT CGT TTA CCT CAC ACT TTC GGC CAA

GGG ACC AAG GTG GAG ATC AAA CGT ACG

(SEQ ID NO: 4)

M S P S Q L I G F L L L W V P A S

R G E I V L T Q S P D S L S V T P

G E R V T I T C R A S Q S I G S S

L H W Y Q Q K P G Q S P K L L I K

Y A S Q S L S G V P S R F S G S G

S G T D F T L T I S S L E A E D F

A V Y Y C H Q S S R L P H T F G Q

G T K V E I K R T

Modified 19D12/15H12 Light Chain-E (SEQ ID NO: 5)

ATG TCG CCA TCA CAA CTC ATT GGG TTT CTG CTG CTC TGG GTT CCA GCC TCC

AGG GGT GAA ATT GTG CTG ACT CAG AGC CCA GGT ACC CTG TCT GTG TCT CCA

GGC GAG AGA GCC ACC CTC TCC TGC CGG GCC AGT CAG AGC ATT GGT AGT AGC

TTA CAC TGG TAC CAG CAG AAA CCA GGT CAG GCT CCA AGG CTT CTC ATC AAG

TAT GCA TCC CAG TCC CTC TCA GGG ATC CCC GAT AGG TTC AGT GGC AGT GGA

TCT GGG ACA GAT TTC ACC CTC ACC ATC AGT AGA CTG GAG CCT GAA GAT GCT

GCA GCG TAT TAC TGT CAT CAG AGT AGT CGT TTA CCT CAC ACT TTC GGC CAA

GGG ACC AAG GTG GAG ATC AAA CGT ACA

(SEQ ID NO: 6)

M S P S Q L I G F L L L W V P A S

R G E I V L T Q S P G T L S V S P

G E R A T L S C R A S Q S I G S S

L H W Y Q Q K P G Q A P R L L I K

Y A S Q S L S G I P D R F S G S G

S G T D F T L T I S R L E P E D A

A A Y Y C H Q S S R L P H T F G Q

G T K V E I K R T

19D12/15H12 Light Chain-F (LCF; SEQ ID NO: 7)

ATG TCG CCA TCA CAA CTC ATT GGG TTT CTG CTG CTC TGG GTT CCA GCC TCC

AGG GGT GAA ATT GTG CTG ACT CAG AGC CCA GGT ACC CTG TCT GTG TCT CCA

GGC GAG AGA GCC ACC CTC TCC TGC CGG GCC AGT CAG AGC ATT GGT AGT AGC

TTA CAC TGG TAC CAG CAG AAA CCA GGT CAG GCT CCA AGG CTT CTC ATC AAG
TAT GCA TCC CAG TCC CTC TCA GGG ATC CCC GAT AGG TTC AGT GGC AGT GGA
TCT GGG ACA GAT TTC ACC CTC ACC ATC AGT AGA CTG GAG CCT GAA GAT TTC
GCA GTG TAT TAC TGT CAT CAG AGT AGT CGT TTA CCT CAC ACT TTC GGC CAA
GGG ACC AAG GTG GAG ATC AAA CGT ACA

(SEQ ID NO: 8)

M S P S Q L I G F L L L W V P A S
R G E I V L T Q S P G T L S V S P
G E R A T L S C R A S Q S I G S S
L H W Y Q Q K P G Q A P R L L I K
Y A S Q S L S G I P D R F S G S G
S G T D F T L T I S R L E P E D F
A V Y Y C H Q S S R L P H T F G Q
G T K V E I K R T

19D12/15H12 heavy chain-A (HCA; SEQ ID NO: 9)

ATG GAG TTT GGG CTG AGC TGG GTT TTC CTT GTT GCT ATA TTA AAA GGT GTC
CAG TGT GAG GTT CAG CTG GTG CAG TCT GGG GGA GGC TTG GTA AAG CCT GGG
GGG TCC CTG AGA CTC TCC TGT GCA GCC TCT GGA TTC ACC TTC AGT AGC TTT
GCT ATG CAC TGG GTT CGC CAG GCT CCA GGA AAA GGT CTG GAG TGG ATA TCA
GTT ATT GAT ACT CGT GGT GCC ACA TAC TAT GCA GAC TCC GTG AAG GGC CGA
TTC ACC ATC TCC AGA GAC AAT GCC AAG AAC TCC TTG TAT CTT CAA ATG AAC
AGC CTG AGA GCC GAG GAC ACT GCT GTG TAT TAC TGT GCA AGA CTG GGG AAC
TTC TAC TAC GGT ATG GAC GTC TGG GGC CAA GGG ACC ACG GTC ACC GTC TCC
TCA

(SEQ ID NO: 10)

Met Glu Phe Gly Leu Ser Trp Val Phe Leu Val Ala Ile Leu Lys Gly Val
Gln Cys Glu Val Gln Leu Val Gln Ser Gly Gly Gly Leu Val Lys Pro Gly
Gly Ser Leu Arg Leu Ser Cys Ala Ala Ser Gly Phe Thr Phe Ser Ser Phe
Ala Met His Trp Val Arg Gln Ala Pro Gly Lys Gly Leu Glu Trp Ile Ser
Val Ile Asp Thr Arg Gly Ala Thr Tyr Tyr Ala Asp Ser Val Lys Gly Arg

Phe Thr Ile Ser Arg Asp Asn Ala Lys Asn Ser Leu Tyr Leu Gln Met Asn Ser Leu Arg Ala Glu Asp Thr Ala Val Tyr Tyr Cys Ala Arg Leu Gly Asn Phe Tyr Tyr Gly Met Asp Val Trp Gly Gln Gly Thr Thr Val Thr Val Ser Ser

Modified 19D12/15H12 heavy chain-B (SEQ ID NO: 11)

ATG GAG TTT GGG CTG AGC TGG GTT TTC CTT GTT GCT ATA TTA AAA GGT GTC CAG TGT GAG GTT CAG CTG GTG CAG TCT GGG GGA GGC TTG GTA CAG CCC GGG GGG TCC CTG AGA CTC TCC TGT GCA GCC TCT GGA TTC ACC TTC AGT AGC TTT GCT ATG CAC TGG GTT CGC CAG GCT CCA GGA AAA GGT CTG GAG TGG ATA TCA GTT ATT GAT ACT CGT GGT GCC ACA TAC TAT GCA GAC TCC GTG AAG GGC CGA TTC ACC ATC TCC AGA GAC AAT GCC AAG AAC TCC TTG TAT CTT CAA ATG AAC AGC CTG AGA GCC GAG GAC ACT GCT GTG TAT TAC TGT GCA AGA CTG GGG AAC TTC TAC TAC GGT ATG GAC GTC TGG GGC CAA GGG ACC ACG GTC ACC GTC TCC TCA

(SEQ ID NO: 12)

Met Glu Phe Gly Leu Ser Trp Val Phe Leu Val Ala Ile Leu Lys Gly Val Gln Cys Glu Val Gln Leu Val Gln Ser Gly Gly Gly Leu Val Gln Pro Gly Gly Ser Leu Arg Leu Ser Cys Ala Ala Ser Gly Phe Thr Phe Ser Ser Phe Ala Met His Trp Val Arg Gln Ala Pro Gly Lys Gly Leu Glu Trp Ile Ser Val Ile Asp Thr Arg Gly Ala Thr Tyr Tyr Ala Asp Ser Val Lys Gly Arg Phe Thr Ile Ser Arg Asp Asn Ala Lys Asn Ser Leu Tyr Leu Gln Met Asn Ser Leu Arg Ala Glu Asp Thr Ala Val Tyr Tyr Cys Ala Arg Leu Gly Asn Phe Tyr Tyr Gly Met Asp Val Trp Gly Gln Gly Thr Thr Val Thr Val Ser Ser

Plasmids comprising a CMV promoter operably linked to the 15H12/19D12 LCC, LCD, LCE, LCF or to the 15H12/19D12 HCA or HCB have been deposited at the American Type Culture Collection (ATCC); 10801 University Boulevard; Manassas, Virginia 20110-2209 on May 21, 2003. The deposit names and the ATCC accession numbers for the plasmids are set forth below:

(1) CMV promoter-15H12/19D12 HCA (γ4)-

Deposit name: "15H12/19D12 HCA (γ4)"

ATCC accession No.: PTA-5214

(2) CMV promoter-15H12/19D12 HCB (γ4)-

Deposit name: "15H12/19D12 HCB (γ4)"

ATCC accession No.: PTA-5215

(3) CMV promoter-15H12/19D12 HCA (γ1)-

Deposit name: "15H12/19D12 HCA (γ1)";

ATCC accession No.: PTA-5216

(4) CMV promoter-15H12/19D12 LCC (κ)-

Deposit name: "15H12/19D12 LCC (κ)";

ATCC accession No.: PTA-5217

(5) CMV promoter-15H12/19D12 LCD (κ)-

Deposit name: "15H12/19D12 LCD (κ)";

ATCC accession No.: PTA-5218

(6) CMV promoter-15H12/19D12 LCE (κ)-

Deposit name: "15H12/19D12 LCE (κ)";

ATCC accession No.: PTA-5219

(7) CMV promoter-15H12/19D12 LCF (κ)-

Deposit name: "15H12/19D12 LCF (κ)";

ATCC accession No.: PTA-5220

All restrictions on access to the plasmids deposited in ATCC will be removed upon grant of a patent. In an embodiment of the present invention, an anti-IGF1R antibody or antigen-binding fragment thereof of the invention comprises any of the CDRs or Ig heavy or light chains or variable regions thereof in any of PTA-5214-PTA-5220. In an embodiment of the invention, the antibody comprises a light chain encoded by the plasmid deposited under number PTA-5220 and a heavy chain encoded by the plasmid deposited under number PTA-5214 or PTA-5216.

In an embodiment, an antibody that binds "specifically" to human IGF1R binds with Kd of about $1.28X10^{-10}$ M or less by Biacore measurement or with a Kd of about $2.05X10^{-12}$ or less by KinExA measurement.

In an embodiment of the invention, an IGF1R inhibitory agent that can be administered to a patient in a method according to the invention comprises any light chain immunoglobulin and/or a heavy chain immunoglobulin as set forth in Published

International Application No. WO 2002/53596 which is herein incorporated by reference in its entirety. For example, in an embodiment, the antibody comprises a light chain variable region comprising an amino acid sequence selected from the group consisting of SEQ ID NOs: 2, 6, 10, 14, 18, 22, 47 and 51 as set forth in WO 2002/53596 and/or a heavy chain variable region comprising an amino acid sequence selected from the group consisting of SEQ ID NOs: 4, 8, 12, 16, 20, 24, 45 and 49 as set forth in WO 2002/53596.

In an embodiment of the invention, an IGF1R inhibitory agent that can be administered to a patient in a method according to the invention comprises any light chain immunoglobulin and/or a heavy chain immunoglobulin as set forth in Published International Application No. WO 2003/59951 which is herein incorporated by reference in its entirety. For example, in an embodiment, the antibody comprises a light chain variable region comprising an amino acid sequence selected from the group consisting of SEQ ID NOs: 54, 61 and 65 as set forth in WO 2003/59951 and/or a heavy chain variable region comprising an amino acid sequence selected from the group consisting of SEQ ID NOs: 69, 75, 79 and 83 as set forth in WO 2003/59951.

In an embodiment of the invention, an IGF1R inhibitory agent that can be administered to a patient in a method according to the invention comprises any light chain immunoglobulin and/or a heavy chain immunoglobulin as set forth in Published International Application No. WO 2004/83248 which is herein incorporated by reference in its entirety. For example, in an embodiment, the antibody comprises a light chain variable region comprising an amino acid sequence selected from the group consisting of SEQ ID NOs: 109, 111, 113, 115, 117, 119, 121, 123, 125, 127, 129, 131, 133, 135, 137, 139, 141 and 143 as set forth in WO 2004/83248 and/or a heavy chain variable region comprising an amino acid sequence selected from the group consisting of SEQ ID NOs: 108, 110, 112, 114, 116, 118, 120, 122, 124, 126, 128, 130, 132, 134, 136, 138, 140 and 142 as set forth in WO 2004/83248.

In an embodiment of the invention, an IGF1R inhibitory agent that can be administered to a patient in a method according to the invention comprises any light chain immunoglobulin and/or a heavy chain immunoglobulin as set forth in Published International Application No. WO 2003/106621 which is herein incorporated by reference in its entirety. For example, in an embodiment, the antibody comprises a light chain variable region comprising an amino acid sequence selected from the group consisting of SEQ ID NOs: 8-12, 58-69, 82-86, 90, 94, 96, 98, as set forth in WO 2003/106621 and/or a heavy chain variable region comprising an amino acid sequence selected from the

group consisting of SEQ ID NOs: 7, 13, 70-81, 87, 88, 92 as set forth in WO 2003/106621.

In an embodiment of the invention, an IGF1R inhibitory agent that can be administered to a patient in a method according to the invention comprises any light chain immunoglobulin and/or a heavy chain immunoglobulin as set forth in Published International Application No. WO 2004/87756 which is herein incorporated by reference in its entirety. For example, in an embodiment, the antibody comprises a light chain variable region comprising an amino acid sequence of SEQ ID NO: 2 as set forth in WO 2004/87756 and/or a heavy chain variable region comprising an amino acid sequence of SEQ ID NO: 1 as set forth in WO 2004/87756.

Furthermore, the scope of the present invention comprises any antibody or antibody fragment comprising one or more CDRs and/or framework regions of any of the light chain immunoglobulin or heavy chain immunoglobulins set forth in WO 2002/53596; WO 2003/59951; WO 2004/83248; WO 2003/106621 or WO 2004/87756 as identified by any of the methods set forth in Chothia *et al.*, J. Mol. Biol. 186:651-663 (1985); Novotny and Haber, Proc. Natl. Acad. Sci. USA 82:4592-4596 (1985) or Kabat, E. A. *et al.*, Sequences of Proteins of Immunological Interest, National Institutes of Health, Bethesda, Md., (1987)).

In an embodiment of the invention, anti-IGF1R antibody is produced by a hybridoma that is deposited at the American Type Culture Collection under deposit no. PTA-2792, PTA-2788, PTA-2790, PTA-2791, PTA-2789 or PTA-2793.

In an embodiment of the invention, an anti-IGF1R antibody of the invention comprises an immunoglobulin heavy chain variable region comprising an amino acid sequence selected from the group consisting of:

```
  1 grlgqawrsl rlscaasgft fsdyymswir qapgkglewv syisssgstr
 51 dyadsvkgrf tisrdnakns lylqmnslra edtavyycvr dgvettfyyy
101 yygmdvwgqg ttvtvssast kgpsvfplap csrstsesta algclvkdyf
151 pepvtvswns galtsgvhtf psca
```

(SEQ ID NO: 13)

```
  1 vqllesgggl vqpggslrls ctasgftfss yamnwvrqap gkglewvsai
 51 sgsggttfya dsvkgrftis rdnsrttlyl qmnslraedt avyycakdlg
101 wsdsyyyyyg mdvwgqgttv tvss
```

(SEQ ID NO: 14)

```
  1 gpglvkpset lsltctvsgg sisnyywswi rqpagkglew igriytsgsp
 51 nynpslksrv tmsvdtsknq fslklnsvta adtavyycav tifgvviifd
101 ywgqgtlvtv ss
```

(SEQ ID NO: 15)

```
  1 evqllesggg lvqpggslrl scaasgftfs syamswvrqa pgkglewvsa
 51 isgsggityy adsvkgrfti srdnskntly lqmnslraed tavyycakdl
```

```
101 gygdfyyyyy gmdvwgqgtt vtvss
```
(SEQ ID NO: 16)

```
  1 pglvkpsetl sltctvsggs issyywswir qppgkglewi gyiyysgstn
 51 ynpslksrvt isvdtsknqf slklssvtaa dtavyycart ysssfyyygm
101 dvwgqgttvt vss
```
(SEQ ID NO: 17)

```
  1 evqllesggg lvqpggslrl scaasgftfs syamswvrqa pgkglewvsg
 51 itgsggstyy adsvkgrfti srdnskntly lqmnslraed tavyycakdp
101 gttvimswfd pwgqgtlvtv ss
```
(SEQ ID NO: 18)

In an embodiment of the invention, an anti-IGF1R antibody of the invention comprises an immunoglobulin light chain variable region comprising an amino acid sequence selected from the group consisting of:

```
  1 asvgdrvtft crasqdirrd lgwyqqkpgk apkrliyaas rlqsgvpsrf
 51 sgsgsgteft ltisslqped fatyyclqhn nyprtfgqgt eveiirtvaa
101 psvfifppsd eqlksgtasv vcllnnfypr eakvqw
```
(SEQ ID NO: 19)

```
  1 diqmtqfpss lsasvgdrvt itcrasqgir ndlgwyqqkp gkapkrliya
 51 asrlhrgvps rfsgsgsgte ftltisslqp edfatyyclq hnsypcsfgq
101 gtkleik
```
(SEQ ID NO: 20)

```
  1 sslsasvgdr vtftcrasqd irrdlgwyqq kpgkapkrli yaasrlqsgv
 51 psrfsgsgsg teftltissl qpedfatyyc lqhnnyprtf gqgteveiir
```
(SEQ ID NO: 21)

```
  1 diqmtqspss lsasvgdrvt itcrasqgir sdlgwfqqkp gkapkrliya
 51 asklhrgvps rfsgsgsgte ftltisrlqp edfatyyclq hnsypltfgg
101 gtkveik
```
(SEQ ID NO: 22)

```
  1 gdrvtitcra sqsistflnw yqqkpgkapk llihvasslq ggvpsrfsgs
 51 gsgtdftlti sslqpedfat yycqqsynap ltfgggtkve ik
```
(SEQ ID NO: 23)

```
  1 ratlscrasq svrgrylawy qqkpgqaprl liygassrat gipdrfsgsg
 51 sgtdftltis rlepedfavf ycqqygsspr tfgqgtkvei k
```
(SEQ ID NO: 24)

In an embodiment of the invention, the anti-IGF1R antibody comprises a light chain immunoglobulin, or a mature fragment thereof (*i.e.*, lacking signal sequence), or variable region thereof, comprising the amino acid sequence of:

```
  1 mdmrvpaqll gllllwfpga rcdiqmtqsp sslsasvgdr vtitcrasqg
 51 irndlgwyqq kpgkapkrli yaasslqsgv psrfsgsgsg teftltissl
101 qpedfatyyc lqhnsypwtf gqgtkveikr tvaapsvfif ppsdeqlksg
151 tasvvcllnn fypreakvqw kvdnalqsgn sqesvteqds kdstyslsst
201 ltlskadyek hkvyacevth qglsspvtks fnrgec   ;
```
(SEQ ID NO: 25)

```
  1 mdmrvpaqll gllllwfpga rcdiqmtqsp sslsasvgdr vtftcrasqd
 51 irrdlgwyqq kpgkapkrli yaasrlqsgv psrfsgsgsg teftltissl
```

101 qpedfatyyc lqhnnyprtf qqgteveiir tvaapsvfif ppsdeqlksg
151 tasvvcllnn fypreakvqw kvdnalqsgn sqesvteqds kdstyslsst
201 ltlskadyek hkvyacevth qglsspvtks fnrgec ;

(SEQ ID NO: 26)

1 mdmrvpaqll gllllwfpga rcdiqmtqsp sslsasvgdr vtitcrasqg
51 irndlgwyqq kpgkapkrli yaasslqsgv psrfsgsgsg teftltissl
101 qpedfatyyc lqhnsypytf qqgtkleikr tvaapsvfif ppsdeqlksg
151 tasvvcllnn fypreakvqw kvdnalqsgn sqesvteqds kdstyslsst
201 ltlskadyek hkvyacevth qglsspvtks fnrgec ;

(SEQ ID NO: 27)

or

1 mdmrvpaqll gllllwfpga rcdiqmtqfp sslsasvgdr vtitcrasqg
51 irndlgwyqq kpgkapkrli yaasrlhrgv psrfsgsgsg teftltissl
101 qpedfatyyc lqhnsypcsf qqgtkleikr tvaapsvfif ppsdeqlksg
151 tasvvcllnn fypreakvqw kvdnalqsgn sqesvteqds kdstyslsst
201 ltlskadyek hkvyacevth qglsspvtks fnrgec

(SEQ ID NO: 28). In an embodiment of the invention, the signal sequence is amino acids 1-22 of SEQ ID NOs: 25-28. In an embodiment of the invention, the mature variable region is underscored.

In an embodiment of the invention, the anti-IGF1R antibody comprises a heavy chain immunoglobulin or a mature fragment thereof (*i.e.*, lacking signal sequence), or a variable region thereof, comprising the amino acid sequence of:

1 mefglswvfl vaiikgvqcq vqlvesgggl vkpggslrls caasgftfsd
51 yymswirqap gkglewvsyi sssgstiyya dsvkgrftis rdnaknslyl
101 qmnslraedt avyycarvlr flewllyyyy yygmdvwgqg ttvtvssast
151 kgpsvfplap csrstsesta algclvkdyf pepvtvswns galtsgvhtf
201 pavlqssgly slssvvtvps snfgtqtytc nvdhkpsntk vdktverkcc
251 vecppcpapp vagpsvflfp pkpkdtlmis rtpevtcvvv dvshedpevq
301 fnwyvdgvev hnaktkpree qfnstfrvvs vltvvhqdwl ngkeykckvs
351 nkglpapiek tisktkgqpr epqvytlpps reemtknqvs ltclvkgfyp
401 sdiavewesn gqpennyktt ppmldsdgsf flyskltvdk srwqqgnvfs
451 csvmhealhn hytqkslsls pgk ;

(SEQ ID NO: 29)

1 mefglswvfl vaiikgvqcq aqlvesgggl vkpggslrls caasgftfsd
51 yymswirqap gkglewvsyi sssgstrdya dsvkgrftis rdnaknslyl
101 qmnslraedt avyycvrdgv ettfyyyyyg mdvwgqgttv tvssastkgp
151 svfplapcsr stsestaalg clvkdyfpep vtvswnsgal tsgvhtfpav
201 lqssglysls svvtvpssnf gtqtytcnvd hkpsntkvdk tverkccvec
251 ppcpappvag psvflfppkp kdtlmisrtp evtcvvvdvs hedpevqfnw
301 yvdgvevhna ktkpreeqfn stfrvvsvlt vvhqdwlngk eykckvsnkg
351 lpapiektis ktkgqprepq vytlppsree mtknqvsltc lvkgfypsdi
401 avewesngqp ennykttppm ldsdgsffly skltvdksrw qqgnvfscsv
451 mhealhnhyt qkslslspgk ;

(SEQ ID NO: 30)

1 mefglswlfl vailkgvqce vqllesgggl vqpggslrls caasgftfss
51 yamswvrqap gkglewvsai sgsggstyya dsvkgrftis rdnskntlyl
101 qmnslraedt avyycakgys sgwyyyyyyg mdvwgqgttv tvssastkgp

```
151 svfplapcsr stsestaalg clvkdyfpep vtvswnsgal tsgvhtfpav
201 lqssglysls svvtvpssnf gtqtytcnvd hkpsntkvdk tverkccvec
251 ppcpappvag psvflfppkp kdtlmisrtp evtcvvvdvs hedpevqfnw
301 yvdgvevhna ktkpreeqfn stfrvvsvlt vvhqdwlngk eykckvsnkg
351 lpapiektis ktkgqprepq vytlppsree mtknqvsltc lvkgfypsdi
401 avewesngqp ennykttppm ldsdgsffly skltvdksrw qqgnvfscsv
451 mhealhnhyt qkslslspgk                ;
```

(SEQ ID NO: 31)

or

```
  1 mefglswlfl vailkgvqce vqllesgggl vqpggslrls ctasgftfss
 51 yamnwvrqap gkglewvsai sgsggttfya dsvkgrftis rdnsrttlyl
101 qmnslraedt avyycakdlg wsdsyyyyyg mdvwgqgttv tvssastkgp
151 svfplapcsr stsestaalg clvkdyfpep vtvswnsgal tsgvhtfpav
201 lqssglysls svvtvpssnf gtqtytcnvd hkpsntkvdk tverkccvec
251 ppcpappvag psvflfppkp kdtlmisrtp evtcvvvdvs hedpevqfnw
301 yvdgvevhna ktkpreeqfn stfrvvsvlt vvhqdwlngk eykckvsnkg
351 lpapiektis ktkgqprepq vytlppsree mtknqvsltc lvkgfypsdi
401 avewesngqp ennykttppm ldsdgsffly skltvdksrw qqgnvfscsv
451 mhealhnhyt qkslslspgk
```

(SEQ ID NO: 32). In an embodiment of the invention, the signal sequence is amino acids 1-19 of SEQ ID NOs: 29-32. In an embodiment of the invention, the mature variable region is underscored.

In an embodiment of the invention, the anti-IGF1R antibody comprises a light chain variable region comprising the amino acid sequence of any of SEQ ID NOs: 19-24 paired with a heavy chain variable region comprising an amino acid sequence of any of SEQ ID NOs: 13-18, respectively. In an embodiment of the invention, the anti-IGF1R antibody comprises a mature light chain variable region comprising an amino acid sequence of any of SEQ ID NOs: 25 or 26 paired with a heavy chain variable region comprising an amino acid sequence of any of SEQ ID NOs: 29 or 30. In an embodiment of the invention, the anti-IGF1R antibody comprises a mature light chain variable region comprising an amino acid sequence of any of SEQ ID NOs: 27 or 28 paired with a heavy chain variable region comprising an amino acid sequence of any of SEQ ID NOs: 31 or 32.

In an embodiment of the invention, an anti-IGF1R antibody of the invention comprises an immunoglobulin heavy chain or mature fragment or variable region of 2.12.1 fx (SEQ ID NO: 33) (in an embodiment of the invention, the leader sequence is underscored):

```
  1 mefglswvfl vaiikgvqcq vqlvesgggl vkpggslrls caasgftfsd
 51 yymswirqap gkglewvsyi sssgstrdya dsvkgrftis rdnaknslyl
101 qmnslraedt avyycardgv ettfyyyyyg mdvwgqgttv tvssastkgp
151 svfplapcsr stsestaalg clvkdyfpep vtvswnsgal tsgvhtfpav
201 lqssglysls svvtvpssnf gtqtytcnvd hkpsntkvdk tverkccvec
251 ppcpappvag psvflfppkp kdtlmisrtp evtcvvvdvs hedpevqfnw
301 yvdgvevhna ktkpreeqfn stfrvvsvlt vvhqdwlngk eykckvsnkg
351 lpapiektis ktkgqprepq vytlppsree mtknqvsltc lvkgfypsdi
401 avewesngqp ennykttppm ldsdgsffly skltvdksrw qqgnvfscsv
```

```
451 mhealhnhyt qkslslspgk
```

In an embodiment of the invention, an anti-IGF1R antibody of the invention comprises mature immunoglobulin heavy chain variable region 2.12.1 fx (amino acids 20-144 or SEQ ID NO: 33; SEQ ID NO: 34):

```
q vqlvesgggl vkpggslrls caasgftfsd yymswirqap gkglewvsyi sssgstrdya
dsvkgrftis rdnaknslyl qmnslraedt avyycardgv ettfyyyyyg mdvwgqgttv tvss
```

In an embodiment of the invention, an anti-IGF1R antibody of the invention comprises an immunoglobulin light chain or mature fragment or variable region 2.12.1 fx (SEQ ID NO: 35) (in an embodiment of the invention, the leader sequence is underscored):

```
  1 mdmrvpaqll glllwfpga rcdiqmtqsp sslsasvgdr vtitcrasqd
 51 irrdlgwyqq kpgkapkrli yaasrlqsgv psrfsgsgsg teftltissl
101 qpedfatyyc lqhnnyprtf gqgtkveikr tvaapsvfif ppsdeqlksg
151 tasvvcllnn fypreakvqw kvdnalqsgn sqesvteqds kdstyslsst
201 ltlskadyek hkvyacevth qglsspvtks fnrgec
```

In an embodiment of the invention, an anti-IGF1R antibody of the invention comprises mature immunoglobulin light chain variable region 2.12.1 fx (amino acids 23-130 of SEQ ID NO: 35; SEQ ID NO: 36):

```
diqmtqsp sslsasvgdr vtitcrasqd irrdlgwyqq kpgkapkrli yaasrlqsgv psrfsgsgsg
teftltissl qpedfatyyc lqhnnyprtf gqgtkveikr
```

In an embodiment of the invention, an anti-IGF1R antibody of the invention comprises a humanized 7C10 immunoglobulin light chain variable region; version 1 (SEQ ID NO: 37):

```
  1 dvvmtqspls lpvtpgepas iscrssqsiv hsngntylqw ylqkpgqspq
 51 lliykvsnrl ygvpdrfsgs gsgtdftlki srveaedvgv yycfqgshvp
101 wtfgqgtkve ik
```

In an embodiment of the invention, an anti-IGF1R antibody of the invention comprises humanized 7C10 immunoglobulin light chain variable region; version 2 (SEQ ID NO: 38):

```
  1 divmtqspls lpvtpgepas iscrssqsiv hsngntylqw ylqkpgqspq
 51 lliykvsnrl ygvpdrfsgs gsgtdftlki srveaedvgv yycfqgshvp
101 wtfgqgtkve ik
```

In an embodiment of the invention, an anti-IGF1R antibody of the invention comprises a humanized 7C10 immunoglobulin heavy chain variable region; version 1 (SEQ ID NO: 39):

```
  1 qvqlqesgpg lvkpsetlsl tctvsgysit ggylwnwirq ppgkglewmg
 51 yisydgtnny kpslkdriti srdtsknqfs lklssvtaad tavyycaryg
101 rvffdywgqg tlvtvss
```

In an embodiment of the invention, an anti-IGF1R antibody of the invention comprises the humanized 7C10 immunoglobulin heavy chain variable region; version 2 (SEQ ID NO: 40):

```
  1 qvqlqesgpg lvkpsetlsl tctvsgysit ggylwnwirq ppgkglewig
 51 yisydgtnny kpslkdrvti srdtsknqfs lklssvtaad tavyycaryg
101 rvffdywgqg tlvtvss
```

In an embodiment of the invention, an anti-IGF1R antibody of the invention comprises the humanized 7C10 immunoglobulin heavy chain variable region; version 3 (SEQ ID NO: 41):

```
  1 qvqlqesgpg lvkpsetlsl tctvsgysis ggylwnwirq ppgkglewig
 51 yisydgtnny kpslkdrvti svdtsknqfs lklssvtaad tavyycaryg
101 rvffdywgqg tlvtvss
```

In an embodiment of the invention, an anti-IGF1R antibody of the invention comprises A12 immunoglobulin heavy chain variable region (SEQ ID NO: 42):

```
  1 evqlvqsgae vkkpgssvkv sckasggtfs syaiswvrqa pgqglewmgg
 51 iipifgtany aqkfqgrvti tadkststay melsslrsed tavyycarap
101 lrflewstqd hyyyyymdvw gkgttvtvss
```

In an embodiment of the invention, an anti-IGF1R antibody of the invention comprises A12 immunoglobulin light chain variable region (SEQ ID NO: 43):

```
  1 sseltqdpav svalgqtvri tcqgdslrsy yaswyqqkpg qapvlviygk
 51 nnrpsgipdr fsgsssgnta sltitgaqae deadyycnsr dnsdnrlifg
101 ggtkltvls
```

or

(SEQ ID NO: 105):

```
  1 sseltqdpav svalgqtvri tcqgdslrsy yatwyqqkpg qapilviyge
 51 nkrpsgipdr fsgsssgnta sltitgaqae deadyycksr dgsgqhlvfg
101 ggtkltvlg
```

In an embodiment of the invention, an anti-IGF1R antibody of the invention comprises 1A immunoglobulin heavy chain variable region (SEQ ID NO: 44):

```
  1 evqlvqsggg lvhpggslrl scagsgfttfr nyamywvrqa pgkglewvsa
 51 igsgggtyya dsvkgrftis rdnaknslyl qmnslraedm avyycarapn
101 wgsdafdiwg qgtmvtvss
```

;optionally including one or more of the following mutations: R30, S30, N31, S31, Y94, H94, D104, E104.

In an embodiment of the invention, an anti-IGF1R antibody of the invention comprises 1A immunoglobulin light chain variable region (SEQ ID NO: 45):

```
  1 diqmtqspss lsasvgdrvt itcrasqgis swlawyqqkp ekapksliya
 51 asslqsgvps rfsgsgsgtd ftltisslqp edfatyycqq ynsypptfgp
101 gtkvdik
```

;optionally including one or more of the following mutations: P96, I96, P100, Q100, R103, K103, V104, L104, D105, E105

In an embodiment of the invention, an anti-IGF1R antibody of the invention comprises single chain antibody (fv) 8A1 (SEQ ID NO: 46):

```
1   evqlvqsgae vkkpgeslti sckgpgynff nywigwvrqm pgkglewmgi
51  iyptdsdtry spsfqgqvti svdksistay lqwsslkasd tamyycarsi
101 rycpggrcys gyygmdvwgq gtmvtvssgg ggsggggsgg ggsseltqdp
151 avsvalgqtv ritcqgdslr syyaswyqqk pgqapvlviy gknnrpsgip
201 drfsgsssgn tasltitgaq aedeadyycn srdssgnhvv fgggtkltvl
251 g
```

In an embodiment of the invention, an anti-IGF1R antibody of the invention comprises single chain antibody (fv) 9A2 (SEQ ID NO: 47):

```
1   qvqlvqsgae vrkpgasvkv scktsgytfr nydinwvrqa pgqglewmgr
51  isghygntdh aqkfqgrftm tkdtststay melrsltfdd tavyycarsq
101 wnvdywgrgt lvtvssgggg sggggsgggg salnfmltqp hsvsespgkt
151 vtisctrssg siasnyvqwy qqrpgssptt vifednrrps gvpdrfsgsi
201 dtssnsaslt isglktedea dyycqsfdst nlvvfgggtk vtvlg
```

In an embodiment of the invention, an anti-IGF1R antibody of the invention comprises single chain antibody (fv) 11A4 (SEQ ID NO: 48):

```
1   evqllesggg lvqpggslrl scaasgftfs syamswvrqa pgkglewvsa
51  isgsggstyy adsvkgrfti srdnskntly lqmnslraed tavyycassp
101 yssrwysfdp wgqgtmvtvs sggggsgggg sggggsalsy eltqppsvsv
151 spgqtatitc sgddlgnkyv swyqqkpgqs pvlviyqdtk rpsgiperfs
201 gsnsgniatl tisgtqavde adyycqvwdt gtvvfgggtk ltvlg
```

In an embodiment of the invention, an anti-IGF1R antibody of the invention comprises single chain antibody (fv) 7A4 (SEQ ID NO: 49):

```
1   evqlvqsgae vkkpgeslti sckgsgynff nywigwvrqm pgkdlewmgi
51  iyptdsdtry spsfqgqvti svdksistay lqwsslkasd tamyycarsi
101 rycpggrcys gyygmdvwgq gtmvtvssgg gssggggsgg ggsseltqdp
151 avsvalgqtv ritcrgdslr nyyaswyqqk pgqapvlviy gknnrpsgip
201 drfsgsssgn tasltitgaq aedeadyycn srdssgnhmv fgggtkltvl
251 g
```

In an embodiment of the invention, an anti-IGF1R antibody of the invention comprises single chain antibody (fv) 11A1 (SEQ ID NO: 50):

```
1   evqlvesggg vvqpgrslrl scaasgftfs dfamhwvrqi pgkglewlsg
51  lrhdgstayy agsvkgrfti srdnsrntvy lqmnslraed tatyycvtgs
101 gssgphafpv wgkgtlvtvs sggggsgggg sggggsalsy vltqppsasg
151 tpgqrvtisc sgsnsnigty tvnwfqqlpg tapklliysn nqrpsgvpdr
201 fsgsksgtsa slaisglqse deadyycaaw ddslngpvfg ggtkvtvlg
```

In an embodiment of the invention, an anti-IGF1R antibody of the invention comprises single chain antibody (fv) 7A6 (SEQ ID NO: 51)

```
1   evqlvqsgae vkkpgeslti sckgsgynff nywigwvrqm pgkglewmgi
51  iyptdsdtry spsfqgqvti svdksistay lqwsslkasd tamyycarsi
```

```
101 rycpggrcys gyygmdvwgq gtlvtvssgg ggsggggsgg ggsseltqdp
151 avsvalgqtv ritcqgdslr syytnwfqqk pgqapllvvy aknkrpsgip
201 drfsgsssgn tasltitgaq aedeadyycn srdssgnhvv fgggtkltvl
251 g
```

In an embodiment of the invention, an anti-IGF1R antibody or an antigen-binding fragment thereof (*e.g.*, a heavy chain or light chain immunoglobulin) of the invention comprises one or more complementarity determing regions (CDR) selected from the group consisting of:

`sywmh` (SEQ ID NO: 52);

`einpsngrtnynekfkr` (SEQ ID NO: 53);

`grpdyygsskwyfdv` (SEQ ID NO: 54);

`rssqsivhsnvntyle` (SEQ ID NO: 55);

`kvsnrfs` (SEQ ID NO: 56); and

`fqgshvppt` (SEQ ID NO: 57).

In an embodiment of the invention, an anti-IGF1R antibody or an antigen-binding fragment thereof of the invention comprises a heavy chain immunoglobulin variable region selected from the group consisting of :

```
  1 qvqlvqsgae vvkpgasvkl sckasgytft sywmhwvkqr pgqglewige
 51 inpsngrtny nqkfqgkatl tvdkssstay mqlssltsed savyyfargr
101 pdyygsskwy fdvwgqgttv tvs
```

(SEQ ID NO: 58);

```
  1 qvqfqqsgae lvkpgasvkl sckasgytft sylmhwikqr pgrglewigr
 51 idpnnvvtkf nekfkskatl tvdkpsstay melssltsed savyycarya
101 ycrpmdywgq gttvtvss
```

(SEQ ID NO: 59);

```
  1 qvqlqqsgae lvkpgasvkl sckasgytft sywmhwvkqr pgqglewige
 51 inpsngrtny nekfkrkatl tvdkssstay mqlssltsed savyyfargr
101 pdyygsskwy fdvwgagttv tvs
```

(SEQ ID NO: 60);

```
  1 qvqlqqsgae lmkpgasvki sckatgytfs sfwiewvkqr pghglewige
 51 ilpgsggthy nekfkgkatf tadkssntay mqlssltsed savyycargh
101 syyfydgdyw gqgtsvtvss
```

(SEQ ID NO: 61);

```
  1 qvqlqqpgsv lvrpgasvkl sckasgytft sswihwakqr pgqglewige
 51 ihpnsgntny nekfkgkatl tvdtssstay vdlssltsed savyycarwr
101 ygspyyfdyw gqgttltvss
```

(SEQ ID NO: 62);

```
  1 qvqlqqpgae lvkpgasvkl sckasgytft sywmhwvkqr pgrglewigr
 51 idpnsggtky nekfkskatl tvdkpsstay mqlssltsed savyycaryd
101 yygssyfdyw gqgttltvss
```

(SEQ ID NO: 63);

```
  1 qvqlvqsgae vvkpgasvkl sckasgytft sywmhwvkqr pgqglewige
 51 inpsngrtny nqkfqgkatl tvdkssstay mqlssltsed savyyfargr
101 pdyygsskwy fdvwgqgttv tvs
```

(SEQ ID NO: 64);

```
  1 qvqlqqsgae lvkpgasvkl sckasgytft sywmhwvkqr pgqglewige
 51 inpsngrtny nekfkrkatl tvdkssstay mqlssltsed savyyfargr
101 pdyygsskwy fdvwgagttv tvss
```

(SEQ ID NO: 65);

```
  1 qvqlvqsgae vvkpgasvkl sckasgytft sywmhwvkqr pgqglewige
 51 inpsngrtny nqkfqgkatl tvdkssstay mqlssltsed savyyfargr
101 pdyygsskwy fdvwgqgttv tvss
```

(SEQ ID NO: 66);

```
  1 qvqlqqsgae lvkpgasvkl sckasgytft sywmhwvkqr pgrglewigr
 51 idpnsggtky nekfkskatl tvdkpsstay mqlssltsed savyycaryd
101 yygssyfdyw gqgttvtvss
```

(SEQ ID NO: 67);

```
  1 qiqlqqsgpe lvrpgasvki sckasgytft dyyihwvkqr pgeglewigw
 51 iypgsgntky nekfkgkatl tvdtssstay mqlssltsed savyfcargg
101 kfamdywgqg tsvtvss
```

(SEQ ID NO: 68);

```
  1 qvqlqqsgae lvkpgasvkl sckasgytft sywmhwvkqr pgqglewige
 51 inpsngrtny nekfkrkatl tvdkssstay mqlssltsed savyyfargr
101 pdyygsskwy fdvwgagttv tvss
```

(SEQ ID NO: 69);

```
  1 qiqlqqsgpe lvkpgasvki sckasgytft dyyinwmkqk pgqglewigw
 51 idpgsgntky nekfkgkatl tvdtssstay mqlssltsed tavyfcarek
101 ttyyyamdyw gqgtsvtvsa
```

(SEQ ID NO: 70);

```
  1 vqlqqsgael mkpgasvkis ckasgytfsd ywiewvkqrp ghglewigei
 51 lpgsgstnyh erfkgkatft adtssstaym qlnsltseds gvyyclhgny
101 dfdgwgqgtt ltvss
```

(SEQ ID NO: 71); and

```
  1 qvqllesgae lmkpgasvki sckatgytfs sfwiewvkqr pghglewige
 51 ilpgsggthy nekfkgkatf tadkssntay mqlssltsed savyycargh
101 syyfydgdyw gqgtsvtvss
```

(SEQ ID NO: 72);

and/or a light chain immunoglobulin variable region selected from the group consisting of:

```
  1 dvlmtqipvs lpvslgdqas iscrssqiiv hnngntylew ylqkpgqspq
 51 lliykvsnrf sgvpdrfsgs gsgtdftlki srveaedlgv yycfqgshvp
101 ftfgsgtkle ikr
```

(SEQ ID NO: 73);

```
  1 dvlmtqtpls lpvslgdpas iscrssqsiv hsnvntylew ylqkpgqspk
 51 lliykvsnrf sgvpdrfsgs gagtdftlri srveaedlgi yycfqgshvp
101 ptfgggtkle ikr
```
(SEQ ID NO: 74);

```
  1 dvlmtqtpls lpvslgdpas iscrssqsiv hsnvntylew ylqkpgqspr
 51 lliykvsnrf sgvpdrfsgs gagtdftlri srveaedlgi yycfqgshvp
101 ptfgggtkle ikr
```
(SEQ ID NO: 75);

```
  1 dvlmtqtpls lpvslgdpas iscrssqsiv hsnvntylew ylqkpgqspk
 51 lliykvsnrf sgvpdrfsgs gagtdftlri srveaedlgi yycfqgshvp
101 ptfgggtkle ikr
```
(SEQ ID NO: 76);

```
  1 dvlmtqtpls lpvslgdpas iscrssqsiv hsnvntylew ylqkpgqspr
 51 lliykvsnrf sgvpdrfsgs gagtdftlri srveaedlgi yycfqgshvp
101 ptfgggtkle ikr
```
(SEQ ID NO: 77);

```
  1 dvlmtqtpls lpvslgdqas iscrssqxiv hsngntylew ylqkpgqspk
 51 lliykvsnrf sgvpdrfsgs gsgtdftlki srveaedlgv yycfqgshvp
101 xtfgggtkle ikr
```
(SEQ ID NO: 78);

```
  1 dvvmtqtpls lpvslgdpas iscrssqsiv hsnvntylew ylqkpgqspk
 51 lliykvsnrf sgvpdrfsgs gagtdftlri srveaedlgi yycfqgshvp
101 ptfgggtkle ikr
```
(SEQ ID NO: 79);

```
  1 dvvmtqtpls lpvslgdpas iscrssqsiv hsnvntylew ylqkpgqspr
 51 lliykvsnrf sgvpdrfsgs gagtdftlri srveaedlgi yycfqgshvp
101 ptfgggtkle ikr
```
(SEQ ID NO: 80);

```
  1 dvlmtqtpls lpvslgdpas iscrssqsiv hsnvntylew ylqkpgqspr
 51 lliykvsnrf sgvpdrfsgs gagtdftlri srveaedlgi yycfqgshvp
101 ptfgggtkle ikr
```
(SEQ ID NO: 81);

```
  1 dvlmtqipvs lpvslgdqas iscrssqiiv hnngntylew ylqkpgqspq
 51 lliykvsnrf sgvpdrfsgs gsgtdftlki srveaedlgv yycfqgshvp
101 ftfgsgtkle ikr
```
(SEQ ID NO: 82);

```
  1 dvlmtqtpls lpvslgdqas iscrfsqsiv hsngntylew ylqksgqspk
 51 lliykvsnrf sgvpdrfsgs gsgtdftlki srveaedlgv yycfqgshvp
101 rtfgggtkle ikr
```
(SEQ ID NO: 83);

```
  1 dvlmtqtpls lpvslgdqas iscrssqsiv hsnvntylew ylqkpgqspk
 51 lliykvsnrf sgvpdrfsgs gsgtdftlri srveaedlgi yycfqgshvp
101 ptfgggtkle ikr
```
(SEQ ID NO: 84);

```
  1 dvvmtqtpls lpvslgdpas iscrssqsiv hsnvntylew ylqkpgqspk
```

```
  51 lliykvsnrf sgvpdrfsgs gagtdftlri srveaedlgi yycfqgshvp
 101 ptfgggtkle ikr
```
(SEQ ID NO: 85);

```
   1 elvmtqtpls lpvslgdqas iscrssqtiv hsngdtyldw flqkpgqspk
  51 lliykvsnrf sgvpdrfsgs gsgtdftlki srveaedlgv yycfqgshvp
 101 ptfgggtkle ikr
```
(SEQ ID NO: 86);

```
   1 dvlmtqtpls lpvslgdpas iscrssqsiv hsnvntylew ylqkpgqspk
  51 lliykvsnrf sgvpdrfsgs gagtdftlri srveaedlgi yycfqgshvp
 101 ptfgggtkle ikr
```
(SEQ ID NO: 87);

```
   1 dvvmtqtpls lpvslgdpas iscrssqsiv hsnvntylew ylqkpgqspr
  51 lliykvsnrf sgvpdrfsgs gagtdftlri srveaedlgi yycfqgshvp
 101 ptfgggtkle ikr
```
(SEQ ID NO: 88);

```
   1 dvlmtqtpvs lsvslgdqas iscrssqsiv hstgntylew ylqkpgqspk
  51 lliykisnrf sgvpdrfsgs gsgtdftlki srveaedlgv yycfqashap
 101 rtfgggtkle ikr
```
(SEQ ID NO: 89);

```
   1 dvlmtqtpls lpvslgdqas isckssqsiv hssgntyfew ylqkpgqspk
  51 lliykvsnrf sgvpdrfsgs gsgtdftlki srveaedlgv yycfqgship
 101 ftfgsgtkle ikr
```
(SEQ ID NO: 90);

```
   1 dieltqtpls lpvslgdqas iscrssqsiv hsngntylew ylqkpgqspk
  51 lliykvsnrf sgvpdrfsgs gsgtdftlki srveaedlgv yycfqgshvp
 101 ytfgggtkle ikr
```
(SEQ ID NO: 91);

```
   1 dvlmtqtpls lpvslgdqas iscrssqsiv hsnvntylew ylqkpgqspk
  51 lliykvsnrf sgvpdrfsgs gsgtdftlri srveaedlgi yycfqgshvp
 101 ptfgggtkle ikr
```
(SEQ ID NO: 92);

```
   1 dvvmtqtpls lpvslgdpas iscrssqsiv hsnvntylew ylqkpgqspr
  51 lliykvsnrf sgvpdrfsgs gagtdftlri srveaedlgi yycfqgshvp
 101 ptfgggtkle ikr
```
(SEQ ID NO: 93);

```
   1 dvlmtqtpls lpvslgdqas iscrssqsiv hsnvntylew ylqkpgqspk
  51 lliykvsnrf sgvpdrfsgs gsgtdftlri srveaedlgi yycfqgshvp
 101 ptfgggtkle ikr
```
(SEQ ID NO: 94);

```
   1 dvvmtqtpls lpvslgdpas iscrssqsiv hsnvntylew ylqkpgqspk
  51 lliykvsnrf sgvpdrfsgs gagtdftlri srveaedlgi yycfqgshvp
 101 ptfgggtkle ikr
```
(SEQ ID NO: 95);

```
   1 dvlmtqtpls lpvslgdqas iscrsnqtil lsdgdtylew ylqkpgqspk
  51 lliykvsnrf sgvpdrfsgs gsgtdftlki srveaedlgv yycfqgshvp
```

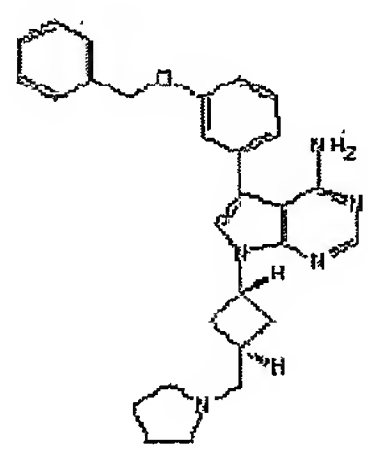
```
101 ptfgggtkle ikr
```
(SEQ ID NO: 96);

```
  1 dvlmtqtpls lpvslgdqas iscrssqtiv hsngntylew ylqkpgqspk
 51 lliykvtnrf sgvpdrfsgs gsgtdftlki srveaedlgv yycfqgthap
101 ytfgggtkle ikr
```
(SEQ ID NO: 97); and

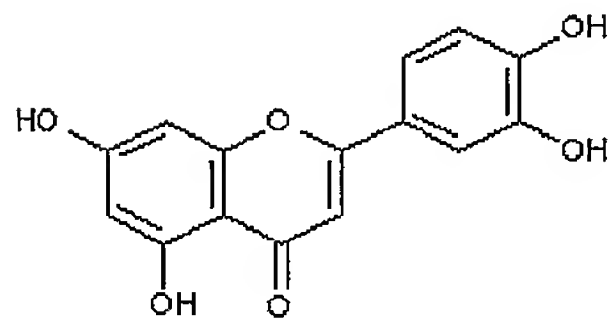
```
  1 dvlmtqtpls lpvslgdqas iscrssqsiv hsngntylew ylqkpgqspk
 51 lliysissrf sgvpdrfsgs gsgtdftlki srvqaedlgv yycfqgshvp
101 ytfgggtkle ikr
```
(SEQ ID NO: 98).

The scope of the present invention includes methods wherein a patient is administered an anti-insulin-like growth factor receptor-1 (IGF1R) antibody wherein the variable region of the antibody is linked to any immunoglobulin constant region. In an embodiment, the light chain variable region is linked to a κ chain constant region. In an embodiment, the heavy chain variable region is linked to a γ1, γ2, γ3 or γ4 chain constant region. Any of the immunoglobulin variable regions set forth herein, in embodiments of the invention, can be linked to any of the foregoing constant regions.

In an embodiment of the invention, an IGF1R inhibitory agent that can be administered to a patient in a method according to the invention is AEW-541 (NVP-AEW-541; NVP-AEW-541-NX-7):



(Novartis; East Hanover, NJ; see WO 2002/92599); or



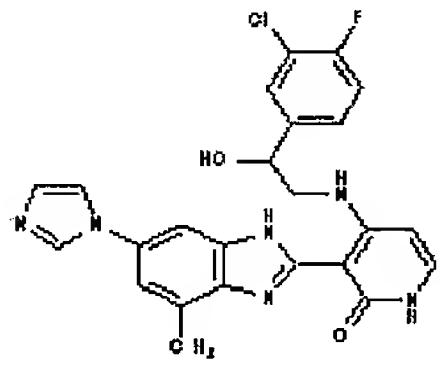
(WO 2003/39538).

In an embodiment of the invention, an IGF1R inhibitory agent that can be administered to a patient in a method according to the invention is any IGF1R anti-sense nucleic acid. For example, in an embodiment, the anti-sense IGF1R nucleic acid is ATL-

1101 (Antisense Therapeutics Ltd; Australia). In an embodiment, the IGF1R anti-sense nucleic acid comprises any of the following nucleotide sequences: 5'-ATCTCTCCGCTTCCTTTC-3' (SEQ ID NO: 99), 5'-ATCTCTCCGCTTCCTTTC-3' (SEQ ID NO: 100), 5'-ATCTCTCCGCTTCCTTTC-3' (SEQ ID NO: 101) or any IGF1R antisense nucleic acid set forth in any of US Published Patent Application No. US20030096769; Published International Application No. WO 2003/100059; Fogarty *et al.*, Antisense Nucleic Acid Drug Dev. 2002 Dec;12(6):369-77; White *et al.*, J Invest Dermatol. 2002 Jun;118(6):1003-7; White *et al.*, Antisense Nucleic Acid Drug Dev. 2000 Jun;10(3):195-203; or Wraight *et al.*, Nat Biotechnol. 2000 May;18(5):521-6.

In an embodiment of the invention, an IGF1R inhibitory agent that can be administered to a patient in a method according to the invention is an anti-IGF-I or II antibody; for example, any antibody disclosed in WO 2003/93317 or EP00492552.

The scope of the present invention includes any kinase inhibitor compound set forth in published international applications WO 2004/030627 or WO 2004/030625. In an embodiment, the kinase inhibitor is (±)-4-[2-(3-chloro-4-fluoro-phenyl)-2-hydroxy-ethylamino]-3-[6-(imidazol-1-yl)-4-methyl-1H-benzimidazol-2-yl]-1H-pyridin-2-one:



(optionally in combination with paclitaxel or with cetuximab).

In an embodiment of the invention, the IGR1R inhibitory agent is a soluble fragment of IGF1R (*e.g.*, amino acids 30-902 of IGF1R) or siRNA (small interfering RNA) against IGF-1R.

In an embodiment, IGF1R comprises the amino acid sequence set forth under Genbank Accession No.: XM_052648 or NM_000612.

The present invention also includes embodiments wherein the patient receives both an IGF1R inhibitory agent in association with one or more other anti-cancer agents, including, but not limited to paclitaxel, thalidomide, docetaxel, gefitinib, temozolomide, lonafarnib, tipifarnib, letrozole, doxorubicin, cis-platin, oxaliplatin, camptothecan, topotecan, etoposide, vincristine, vinblastine, raloxifene, gemcitabine, retinoic acid, tamoxifen, trastuzumab, cetuximab or octreotide; or anti-cancer therapeutic procedures

including, but not limited to, surgical tumorectomy or anti-cancer radiation therapy. The present invention further includes embodiment wherein two or more IGF1R inhibitory agents are administered in association with one another.

The term "in association" indicates that the components of the combinations of the invention can be formulated into a single composition for simultaneous delivery or formulated separately into two or more compositions (*e.g.*, a kit). Furthermore, each component of a combination of the invention can be administered to a subject at a different time than when the other component is administered; for example, each administration may be given non-simultaneously at several intervals over a given period of time. Moreover, the separate components may be administered to a subject by the same or by a different route (*e.g.*, orally, intravenously, intratumorally).

Generation of Antibodies

Any suitable method can be used to elicit an antibody with the desired biologic properties to inhibit IGF1R. It is desirable to prepare monoclonal antibodies (mAbs) from various mammalian hosts, such as mice, rodents, primates, humans, etc. Description of techniques for preparing such monoclonal antibodies may be found in, *e.g.*, Stites, *et al.* (eds.) BASIC AND CLINICAL IMMUNOLOGY (4th ed.) Lange Medical Publications, Los Altos, CA, and references cited therein; Harlow and Lane (1988) ANTIBODIES: A LABORATORY MANUAL CSH Press; Goding (1986) MONOCLONAL ANTIBODIES: PRINCIPLES AND PRACTICE (2d ed.) Academic Press, New York, NY. Thus, monoclonal antibodies may be obtained by a variety of techniques familiar to researchers skilled in the art. Typically, spleen cells from an animal immunized with a desired antigen are immortalized, commonly by fusion with a myeloma cell. See Kohler and Milstein (1976) Eur. J. Immunol. 6:511-519. Alternative methods of immortalization include transformation with Epstein Barr Virus, oncogenes, or retroviruses, or other methods known in the art. See, e.g., Doyle, *et al.* (eds. 1994 and periodic supplements) CELL AND TISSUE CULTURE: LABORATORY PROCEDURES, John Wiley and Sons, New York, NY. Colonies arising from single immortalized cells are screened for production of antibodies of the desired specificity and affinity for the antigen, and yield of the monoclonal antibodies produced by such cells may be enhanced by various techniques, including injection into the peritoneal cavity of a vertebrate host. Alternatively, one may isolate DNA sequences which encode a monoclonal antibody or a binding fragment thereof by screening a DNA library from human B cells according, *e.g.*, to the general

protocol outlined by Huse, *et al.* (1989) Science 246:1275-1281. Modified antibodies can be generated, for example, by introducing mutations in DNA encoding an immunoglobulin chain, for example, by use of conventional recombinant biological techniques.

Other suitable techniques involve selection of libraries of antibodies in phage or similar vectors. See, *e.g.*, Huse *et al.*, Science 246:1275-1281 (1989); and Ward *et al.*, Nature 341:544-546 (1989). The polypeptides and antibodies of the present invention may be used with or without modification, including chimeric or humanized antibodies. Frequently, the polypeptides and antibodies will be labeled by joining, either covalently or non-covalently, a substance which provides for a detectable signal. A wide variety of labels and conjugation techniques are known and are reported extensively in both the scientific and patent literature. Suitable labels include radionuclides, enzymes, substrates, cofactors, inhibitors, fluorescent moieties, chemiluminescent moieties, magnetic particles, and the like. Patents teaching the use of such labels include U.S. Patent Nos. 3,817,837; 3,850,752; 3,939,350; 3,996,345; 4,277,437; 4,275,149; and 4,366,241. Also, recombinant immunoglobulins may be produced, see Cabilly U.S. Patent No. 4,816,567; and Queen *et al.* (1989) Proc. Nat'l Acad. Sci. USA 86:10029-10033; or made in transgenic mice, see Mendez *et al.* (1997) Nature Genetics 15:146-156. Further methods for producing chimeric, humanized and human antibodies are well known in the art. See, *e.g.*, U.S. Pat. No. 5,530,101, issued to Queen *et al*, U.S. Pat. No. 5,225,539, issued to Winter *et al*, U. S. Pat. Nos. 4,816,397 issued to Boss *et al*, all of which are incorporated by reference in their entirety.

Tumor analysis

The methods of the present method comprise determining whether tumor cells comprising one or more of the following characteristics:

(i) IRS-1 phosphorylation on tyrosine 896;

(ii) IRS-1 phosphorylation on tyrosine 612;

(iii) IRS-1 phosphorylation on any tyrosine;

(iv) IGF-II expression;

(v) IGF1R phosphorylation on any tyrosine; or

(vi) expression of IGF1R.

Tumor cells can be assayed to determine whether any of these characteristics are present by any of several methods commonly known in the art. In an embodiment, IRS-1 or IGF1R tyrosine phosphorylation can be determine by western blot analysis with an anti-

phosphotyrosine antibody. For example, anti-phosphotyrosine antibodies PY20, PT66 and P-Try-100 are commercially available from PerkinElmer Life and Analytical Sciences, Inc. (Boston, MA); and anti-phosphotyrosine antibody 4G10 is commercially available from Upstate Cell Signaling Solutions (Waltham, MA). Western blot analysis is a conventional method that is well known in the art. In an embodiment, IRS-1 or IGF1R tyrosine phosphorylation can be determine by an Enzyme linked immunosorbent assay (ELISA) or immunoprecipitation. In an embodiment, expression of IGF1R or IGF-II by tumor cells can, similarly, be determined by western blot analysis, immunoprecipitation or by ELISA. Any of several anti-IGF1R antibodies known in the art, for example, as described herein, can be used.

Many references are available to provide guidance in applying the above techniques (Kohler *et al.*, Hybridoma Techniques (Cold Spring Harbor Laboratory, New York, 1980); Tijssen, Practice and Theory of Enzyme Immunoassays (Elsevier, Amsterdam, 1985); Campbell, Monoclonal Antibody Technology (Elsevier, Amsterdam, 1984); Hurrell, Monoclonal Hybridoma Antibodies: Techniques and Applications (CRC Press, Boca Raton, FL, 1982); Zola, Monoclonal Antibodies: A Manual of Techniques, pp. 147-158 (CRC Press, Inc., 1987)).

In an embodiment of the invention, IGF-II expression by a tumor cell can be determined by *IGF-II* RNA detection. In an embodiment of the invention, IGF-II RNA is determined by northern blot analysis. Northern blot analysis is a conventional technique well known in the art and is described, for example, in Molecular Cloning, a Laboratory Manual, second edition, 1989, Sambrook, Fritch, Maniatis, Cold Spring Harbor Press, 10 Skyline Drive, Plainview, NY 11803-2500.

Dosage

In an embodiment, an IGF1R inhibitory agent is administered to a patient at a "therapeutically effective dosage" or "therapeutically effective amount" which preferably inhibits a disease or condition (*e.g.*, tumor growth) to any extent-preferably by at least about 20%, more preferably by at least about 40%, even more preferably by at least about 60%, and still more preferably by at least about 80%-100% relative to untreated subjects. In an embodiment of the invention, the term "therapeutically effective amount" or "therapeutically effective dosage" means that amount or dosage of an IGF1R inhibitory agent (*e.g.*, an anti-IGF1R antibody or antigen-binding fragment thereof) that will elicit a biological or medical response of a tissue, system, subject or host that is being sought by

the administrator (such as a researcher, doctor or veterinarian) which includes any measurable alleviation of the signs, symptoms and/or clinical indicia of cancer (*e.g.*, tumor growth) and/or the prevention, slowing or halting of progression or metastasis of cancer to any degree. The ability of an IGF1R inhibitory agent to inhibit cancer can be evaluated in an animal model system predictive of efficacy in human tumors. Alternatively, efficacy can be evaluated by examining the ability of a treatment of the invention or any component thereof to inhibit tumor cell growth *in vitro* by assays well-known to the skilled practitioner. One of ordinary skill in the art would be able to determine such amounts based on such factors as the subject's size, the severity of the subject's symptoms, and the particular composition or route of administration selected.

A clinician may use any of several methods known in the art to measure the effectiveness of a particular dosage scheme of an IGF1R inhibitory agent. For example, tumor size can be determined in a non-invasive route, such as by X-ray, positron emission tomography (PET) scan, computed tomography (CT) scan or magnetic resonance imaging (MRI).

A cancer or a tumor cell is "responsive" to an IGF1R inhibitory agent if the agent can provide any measurable alleviation of the signs, symptoms and/or clinical indicia of cancer (*e.g.*, tumor growth) and/or the prevention, slowing or halting of progression or metastasis of cancer to any degree.

Dosage regimens may be adjusted to provide the optimum desired response (*e.g.*, a therapeutic response). For example, a dose may be administered, several divided doses may be administered over time or the dose may be proportionally reduced or increased as indicated by exigencies of the therapeutic situation. It is especially advantageous to formulate parenteral compositions in dosage unit form for ease of administration and uniformity of dosage.

A physician or veterinarian having ordinary skill in the art can readily determine and prescribe the effective amount of the pharmaceutical composition required. For example, the physician or veterinarian could start doses of an IGF1R inhibitory agent employed in the pharmaceutical composition at levels lower than that required in order to achieve the desired therapeutic effect and gradually increase the dosage until the desired effect is achieved. The effectiveness of a given dose or treatment regimen of IGF1R inhibitory agent can be determined , for example, by determining whether a tumor being treated in the subject shrinks or ceases to grow.

In an embodiment of the invention, administration of IGF1R inhibitory agent is by injection proximal to the site of the target (*e.g.*, tumor). In an embodiment, a therapeutically effective daily dose of IGF1R inhibitory agent or pharmaceutical composition thereof is administered as two, three, four, five, six or more sub-doses administered separately at appropriate intervals throughout the day. In an embodiment, a "therapeutically effective" dosage of any anti-IGFR antibody (*e.g.*, 19D12/15H12 LCF/HCA) is in the range of about 3 mg/kg (body weight) to about 20 mg/kg (*e.g.*, 3 mg/kg, 4 mg/kg, 5 mg/kg, 6 mg/kg, 7 mg/kg, 8 mg/kg, 9 mg/kg, 10 mg/kg, 11 mg/kg, 12 mg/kg, 13 mg/kg, 14 mg/kg, 15 mg/kg, 16 mg/kg, 17 mg/kg, 18 mg/kg, 19 mg/kg or 20 mg/kg) per day. In an embodiment, a "therapeutically effective dosage" of a chemotherapeutic agent (e.g., an IGF1R inhibitory agent) is whenever possible as set forth in the Physicians' Desk Reference 2003 (Thomson Healthcare; 57th edition (November 1, 2002)) which is herein incorporated by reference. For example, in an embodiment of the invention, a therapeutically effective dosage of NVP-ADW-742 is about 1 mg/kg/day to about 50 mg/kg/day (*e.g.*, 5 mg/kg/day, 10 mg/kg/day, 15 mg/kg/day, 20 mg/kg/day, 25 mg/kg/day, 30 mg/kg/day, 35 mg/kg/day, 40 mg/kg/day, 45 mg/kg/day).

Therapeutic Methods and Administration

An IGF1R inhibitory agent can be used to inhibit or reduce the growth or proliferation of any cell, such as a malignant cell, either *in vitro* (*e.g.*, in cell culture) or *in vivo* (*e.g.*, within the body of a subject suffering from a disease mediated by elevated expression or activity of IGF1R or by elevated expression of its ligand (*e.g.*, IGF-I or IGF-II)). Such inhibition or reduction of growth or proliferation of a cell can be achieved by contacting the cell with the IGF1R inhibitory agent.

In an embodiment, an IGF1R inhibitory agent is for treating cancer in a patient that is characterized by one or more of the following characteristics: (i) IRS-1 phosphorylation on tyrosine 896; (ii) IRS-1 phosphorylation on tyrosine 612; (iii) IRS-1 phosphorylation on any tyrosine; (iv) IGF-II expression; (v) IGF1R phosphorylation on any tyrosine; or (vi) expression of IGF1R. For example, in an embodiment, the cancer is bladder cancer, Wilm's cancer, bone cancer, prostate cancer, lung cancer, endometrial cancer, multiple myeloma, non-small cell lung cancer (NSCLC), colon cancer, rectal cancer, colorectal cancer, breast cancer (estrogen receptor $^{+}$ or estrogen receptor $^{-}$), cervical cancer, synovial sarcoma, ovarian cancer, pancreatic cancer, neuroblastoma, rhabdomyosarcoma, osteosarcoma, diarrhea associated with metastatic carcinoid or

vasoactive intestinal peptide secreting tumor (*e.g.*, VIPoma or Werner-Morrison syndrome).

In an embodiment, it is in initially determined if a prospective patient to be treated with an IGF1R inhibitory agent suffers from a variety of cancer that is commonly known to exhibit one of the following characteristics: (i) IRS-1 phosphorylation on tyrosine 896; (ii) IRS-1 phosphorylation on tyrosine 612; (iii) IRS-1 phosphorylation on any tyrosine; (iv) IGF-II expression; (v) IGF1R phosphorylation on any tyrosine; or (vi) expression of IGF1R. If the patient is determined to suffer from a cancer known to be characterized by one or more of the 6 characteristics set forth above, the patient is selected for treatment with an IGF1R inhibitory agent. A tumor type may be known to comprise any of the listed characteristics, for example, if such is established in scientific literature (*e.g.*, periodic journals or textbooks) or if such is commonly known in the art by practitioners of ordinary skill or if such a characteristic has ever been observed in one or more patients or tumors, or if such can reasonably be inferred from experimental data (e.g., *in vitro* or *in vivo* data including animal data).

In an embodiment of the invention, a prospective patient's individual tumor is analyzed and it is determined whether the tumor exhibits one of more of the 6 characteristics: (i) IRS-1 phosphorylation on tyrosine 896; (ii) IRS-1 phosphorylation on tyrosine 612; (iii) IRS-1 phosphorylation on any tyrosine; (iv) IGF-II expression; (v) IGF1R phosphorylation on any tyrosine; or (vi) expression of IGF1R. In this embodiment, if the patient's tumor is determined to be characterized by one or more of the 6 characteristics set forth above, the patient is selected for treatment with an IGF1R inhibitory agent. In an embodiment, it is first determined whether the patient's tumor expresses the characteristic (i) IRS-1 phosphorylation on tyrosine 896 or (ii) IRS-1 phosphorylation on tyrosine 612; then, if such a characteristic is identified, it is determined whether the tumor comprises the characteristic (iv) IGF-II expression; if the patient's tumor is determined to express characteristic (i) or (ii) and characteristic (iv), then the patient is selected for treatment with an IGF1R inhibitory agent.

The cells from a particular patient's tumor can be obtained surgically, for example, by surgical biopsy. For example, a tumor biopsy can be taken by endoscopic biopsy, excisional or incisional biopsy or fine needle aspiration (FNA) biopsy.

The term "patient" or "subject" includes any organism, preferably an animal, more preferably a mammal (*e.g.*, rat, mouse, dog, cat, rabbit) and most preferably a human.

As stated above, in an embodiment of the invention, where possible, an IGF1R inhibitory agent is administered to a subject in accordance with the Physicians' Desk Reference 2003 (Thomson Healthcare; 57th edition (November 1, 2002)) or as set forth herein.

An IGF1R inhibitory agent can be administered by an invasive route such as by injection (see above). Administration by a non-invasive route (*e.g.*, orally; for example, in a pill, capsule or tablet) is also within the scope of the present invention. In an embodiment of the invention, an anti-IGF1R antibody (e.g., 15H12/19D12 LCF/HCA), or pharmaceutical composition thereof, is administered intravenously, subcutaneously, intramuscularly, intraarterially or intratumorally.

An IGF1R inhibitory agent can be administered with medical devices known in the art. For example, a pharmaceutical composition of the invention can be administered by injection with a hypodermic needle.

The pharmaceutical compositions of the invention may also be administered with a needleless hypodermic injection device; such as the devices disclosed in U.S. Patent Nos. 6,620,135; 6,096,002; 5,399,163; 5,383,851; 5,312,335; 5,064,413; 4,941,880; 4,790,824 or 4,596,556.

Examples of well-known implants and modules for administering pharmaceutical compositions include: U.S. Patent No. 4,487,603, which discloses an implantable micro-infusion pump for dispensing medication at a controlled rate; U.S. Patent No. 4,447,233, which discloses a medication infusion pump for delivering medication at a precise infusion rate; U.S. Patent No. 4,447,224, which discloses a variable flow implantable infusion apparatus for continuous drug delivery; U.S. Patent No. 4,439,196, which discloses an osmotic drug delivery system having multi-chamber compartments. Many other such implants, delivery systems, and modules are well known to those skilled in the art.

Pharmaceutical Compositions

An IGF1R inhibitory agent can be incorporated into a pharmaceutical composition, along with a pharmaceutically acceptable carrier, suitable for administration to a subject *in vivo*. The scope of the present invention includes pharmaceutical compositions which are suitable to be administered to a subject by any route including, for example, oral, ocular, topical, pulmonary (inhalation), intratumoral injection, intravenous injection, subcutaneous injection or intramuscular injection.

For general information concerning formulations, see, *e.g.*, Gilman, *et al.*, (eds.) (1990), The Pharmacological Bases of Therapeutics, 8th Ed., Pergamon Press; A. Gennaro (ed.), Remington's Pharmaceutical Sciences, 18th Edition, (1990), Mack Publishing Co., Easton, Pennsylvania.; Avis, *et al.*, (eds.) (1993) Pharmaceutical Dosage Forms: Parenteral Medications Dekker, New York; Lieberman, *et al.*, (eds.) (1990) Pharmaceutical Dosage Forms: Tablets Dekker, New York; and Lieberman, *et al.*, (eds.) (1990), Pharmaceutical Dosage Forms: Disperse Systems Dekker, New York, Kenneth A. Walters (ed.) (2002) Dermatological and Transdermal Formulations (Drugs and the Pharmaceutical Sciences), Vol 119, Marcel Dekker.

Pharmaceutically acceptable carriers are conventional and very well known in the art. Examples include aqueous and nonaqueous carriers, stabilizers, antioxidants, solvents, dispersion media, coatings, antimicrobial agents, buffers, serum proteins, isotonic and absorption delaying agents, and the like that are physiologically compatible. Preferably, the carrier is suitable for injection into a subject's body.

Examples of suitable aqueous and nonaqueous carriers which may be employed in the pharmaceutical compositions of the invention include water, ethanol, polyols (such as glycerol, propylene glycol, polyethylene glycol, and the like), and suitable mixtures thereof, vegetable oils, such as olive oil, and injectable organic esters, such as ethyl oleate. Proper fluidity can be maintained, for example, by the use of coating materials, such as lecithin, by the maintenance of the required particle size in the case of dispersions, and by the use of surfactants.

Examples of pharmaceutically-acceptable antioxidants include: water soluble antioxidants such as ascorbic acid, cysteine hydrochloride, sodium bisulfate, sodium metabisulfite, sodium sulfite and the like; and oil-soluble antioxidants such as ascorbyl palmitate, butylated hydroxyanisole (BHA), butylated hydroxytoluene (BHT), lecithin, propyl gallate, alpha-tocopherol, and the like; and metal chelating agents, such as citric acid, ethylenediamine tetraacetic acid (EDTA), sorbitol, tartaric acid, phosphoric acid, and the like.

Prevention of the presence of microorganisms may be ensured both by sterilization procedures, and by the inclusion of various antimicrobial agents such as EDTA, EGTA, paraben, chlorobutanol, phenol sorbic acid, and the like.

Suitable buffers which may be included in the pharmaceutical compositions of the invention include L-histidine based buffers, phosphate based buffers (*e.g.*, phosphate buffered saline, pH $\simeq$ 7), sorbate based buffers or glycine-based buffers.

Serum proteins which may be included in the pharmaceutical compositions of the invention may include human serum albumin.

Isotonic agents, such as sugars (*e.g.*, sucrose), ethanol, polyalcohols (*e.g.*, glycerol, propylene glycol, liquid polyethylene glycol, mannitol or sorbitol), sodium citrate or sodium chloride (*e.g.*, buffered saline) may also be included in the pharmaceutical compositions of the invention. In an embodiment of the invention, the sugar, for example, glucose or sucrose is present at a high concentration (*e.g.*, about 10-100 mg/ml, *e.g.*, 50mg/ml, 60 mg/ml or 70 mg/ml).

Prolonged absorption of an injectable pharmaceutical form may be brought about by the inclusion of agents which delay absorption such as aluminum monostearate and/or gelatin.

Dispersions can also be prepared in glycerol, liquid polyethylene glycols, and mixtures thereof and in oils.

Pharmaceutically acceptable carriers include sterile aqueous solutions or dispersions and sterile powders for the extemporaneous preparation of sterile injectable solutions or dispersions. The use of such media and agents for pharmaceutically active substances is well known in the art.

Sterile injectable solutions comprising an anti-IGF1R antibody can be prepared by incorporating the antibody or antigen-binding fragment thereof in the required amount in an appropriate solvent, optionally with one or a combination of ingredients enumerated above, as required, followed by sterilization microfiltration. Generally, dispersions are prepared by incorporating the antibody into a sterile vehicle that contains a basic dispersion medium and the required other ingredients from those enumerated above. In the case of sterile powders for the preparation of sterile injectable solutions, the preferred methods of preparation are vacuum drying and freeze-drying (lyophilization) that yield a powder of the active ingredient plus any additional, desired ingredient from a previously sterile-filtered solution thereof.

In an embodiment of the invention, an anti-IGF1R antibody of the invention is in a pharmaceutical formulation comprising a therapeutically effective amount of said antibody, a buffer and sucrose. For example, in an embodiment of the invention, the buffer is any one of phosphate buffer, citrate buffer, histidine buffer, glycine buffer or acetate buffer. The pharmaceutical formulation can be within any suitable pH range. In an embodiment of the invention, the pH is 5.0, 5.5, 6.0, 7.5, or between about 5.5 and about 6 or between about 5 and about 7.

An IGF1R inhibitory agent including an anti-IGF1R antibody or antigen-binding fragment thereof can be orally administered. Pharmaceutical compositions for oral administration may contain, in addition to the binding composition, additives such as starch (*e.g.*, potato, maize or wheat starch or cellulose), starch derivatives (*e.g.*, microcrystalline cellulose or silica), sugars (*e.g.*, lactose), talc, stearate, magnesium carbonate or calcium phosphate. In order to ensure that oral compositions comprising an antibody or antigen-binding fragment of the invention are well tolerated by the patient's digestive system, mucus formers or resins may be included. It may also be desirable to improve tolerance by formulating the antibody or antigen-binding fragment in a capsule which is insoluble in the gastric juices. An exemplary pharmaceutical composition of this invention in the form of a capsule is prepared by filling a standard two-piece hard gelatin capsule with the antibody or antigen-binding fragment of the invention in powdered form, lactose, talc and magnesium stearate. Oral administration of immunoglobulins has been described (Foster, *et al.*, (2001) Cochrane Database System rev. 3:CD001816)

An IGF1R inhibitory agent may also be included in a pharmaceutical composition for topical administration. Formulations suitable for topical administration include liquid or semi-liquid preparations suitable for penetration through the skin to the site where treatment is required, such as liniments, lotions, creams, ointments or pastes, and drops suitable for administration to the eye, ear or nose.

Drops may comprise sterile aqueous or oily solutions or suspensions and may be prepared by dissolving an IGF1R inhibitory agent in a suitable aqueous solution of a bactericidal and/or fungicidal agent and/or any other suitable preservative, and preferably including a surface active agent. The resulting solution may then be clarified by filtration.

Lotions according to the present invention include those suitable for application to the skin or eye. An eye lotion may comprise a sterile, aqueous solution optionally containing a bactericide and may be prepared by methods similar to those for the preparation of drops. Lotions or liniments for application to the skin may also include an agent to hasten drying and to cool the skin, such as an alcohol or acetone, and/or a moisturizer such as glycerol or an oil such as castor oil or arachis oil.

Creams, ointments or pastes according to the present invention are semi-solid formulations of the active ingredient for external application. They may be made by mixing an IGF1R inhibitory agent in finely-divided or powdered form, alone or in solution or suspension in an aqueous or non-aqueous fluid, with the aid of suitable machinery, with a greasy or non-greasy basis. The basis may comprise hydrocarbons such as hard, soft

or liquid paraffin, glycerol, beeswax, a metallic soap; a mucilage; an oil of natural origin such as almond, corn, arachis, castor or olive oil; wool fat or its derivatives, or a fatty acid such as stearic or oleic acid together with an alcohol such as propylene glycol or macrogels. The formulation may incorporate any suitable surface active agent such as an anionic, cationic or non-ionic surface active such as sorbitan esters or polyoxyethylene derivatives thereof. Suspending agents such as natural gums, cellulose derivatives or inorganic materials such as silicaceous silicas, and other ingredients such as lanolin, may also be included.

An IGF1R inhibitory agent may also be administered by inhalation. A suitable pharmaceutical composition for inhalation may be an aerosol. An exemplary pharmaceutical composition for inhalation of an antibody or antigen-binding fragment of the invention may include: an aerosol container with a capacity of 15-20 ml comprising the antibody or antigen-binding fragment of the invention, a lubricating agent, such as polysorbate 85 or oleic acid, dispersed in a propellant, such as freon, preferably in a combination of 1,2-dichlorotetrafluoroethane and difluorochloromethane. Preferably, the composition is in an appropriate aerosol container adapted for either intranasal or oral inhalation administration.

Kits and Articles of Manufacture

Kits and articles of manufacture of the present invention include an IGF1R inhibitory agent, preferably combined with a pharmaceutically acceptable carrier, in a pharmaceutical formulation, more preferably in a pharmaceutical dosage form such as a pill, a powder, an injectable liquid, a tablet, dispersible granules, a capsule, a cachet or a suppository. See for example, Gilman *et al.* (eds.) (1990), The Pharmacological Bases of Therapeutics, 8th Ed., Pergamon Press; and Remington's Pharmaceutical Sciences, supra, Easton, Penn.; Avis *et al.* (eds.) (1993) Pharmaceutical Dosage Forms: Parenteral Medications Dekker, New York; Lieberman *et al.* (eds.) (1990) Pharmaceutical Dosage Forms: Tablets Dekker, New York; and Lieberman *et al.* (eds.) (1990), Pharmaceutical Dosage Forms: Disperse Systems Dekker, New York.

The kits and articles of manufacture of the present invention also include information, for example in the form of a package insert or label, indicating that the target of the IGF1R inhibitory agent is IGF1R. The term "target" indicates that the agent reduces or inhibits ligand binding, kinase activity, expression or any other biological activity of

IGF1R in any way. The insert or label may take any form, such as paper or on electronic media such as a magnetically recorded medium (*e.g.*, floppy disk) or a CD-ROM.

The label or insert may also include other information concerning the pharmaceutical compositions and dosage forms in the kit or article of manufacture. Generally, such information aids patients and physicians in using the enclosed pharmaceutical compositions and dosage forms effectively and safely. For example, the following information regarding the IGF1R inhibitory agent may be supplied in the insert: pharmacokinetics, pharmacodynamics, clinical studies, efficacy parameters, indications and usage, contraindications, warnings, precautions, adverse reactions, overdosage, proper dosage and administration, how supplied, proper storage conditions, references and patent information.

Examples

This section is intended to further describe the present invention and should not be construed to further limit the invention. Any composition or method set forth herein comprises part of the present invention.

In this example, the level of phosphorylation of IRS-1 in human lung tumor tissue was compared to that of normal tissue samples and found to be higher in tumor cells than in normal cells. Also, the *in vivo* efficacy of the anti-IGF1R antibody 19D12/15H12 LCF/HCA was correlated with the ability of the IGF-1 to cause IRS-1 phosphorylation. In addition, the level of *IGF-II* mRNA expression was evaluated in 56 different normal and cancerous ovarian and colorectal tissue samples and found to be high in several samples of tumor tissue.

Tumor lysate preparation. Tumor tissues were first weighed and pulverized into fine powder with a pre-chilled pulverizer on dry ice. Tumor powders were transferred into a tube, and 4.5x volume of the buffer A (*i.e.*, 450 ul buffer A per 100 mg tissue) was added. The samples were sonicated for 30 seconds, 0.5x volume of buffer B (*i.e.*, add 50 ul buffer B per 100 mg tissue powder) was added, and samples were spun for 13,000 rpm for 20 min at 4°C after incubation on ice for 30 min. Supernatants were collected and protein concentrations of the lysates were determined by Bio-Rad assay.

Buffer A: 50 mM Hepes, pH 7.4, 150 mM NaCl, 5% Glycerol, 1.5 mM MgCl2, 2 mM Sodium Vanadate, 5 mM NaF, Protease inhibitors (2x concentrated C complete EDTA-

free from Roche-cat #. 1 873 580), Phosphatase inhibitor Cocktail 1 (Sigma p2850), Phosphatase inhibitor Cocktail 2 (Sigma p5726).

Buffer B: Buffer A plus 10% Triton -100

Cell culture lysate preparation. Cells were washed in PBS once, lysed in buffer containing 50 mM Hepes, pH7.4, 150 mM NaCl, 10% glycerol, 1% Triton X-100, 1.5 mM MgCl2, 2 mM Na3VO4 and protease inhibitor cocktail (CompleteTM, Roche Diagnostics GmbH; Mannheim, Germany). Samples were spun for 13,000 rpm for 10 min at 4°C after incubation on ice for 30 min. Supernatants were collected and protein concentrations of the lysates were determined by Bio-Rad assay.

Western analysis. Equal amounts of cell or tumor lysates were separated on a SDS-PAGE, transferred to nitrocellulose filters, probed with desired antibodies, and visualized by ECL (Amersham; Piscataway, NJ). Antibodies for detecting IGFR and IRS-1 were from Santa Cruz Biotechnology (Santa Cruz, CA). Antibodies against phospho-IRS1[pY896] and phospho-IRS1[pY612] were from Biosource (Camarillo, CA).

IGF-II protein measurement. Cells from various cell lines were seeded in T-175 plates in medium containing 10% FBS. After cells were attached, medium was changed to serum free medium. Medium was collected, all debris was spun down, and the supernatants were lyophilized. Cells on the plates were trypsinized and counted. Water was added to each lyophilized supernatant sample (1 ml/2x10^7 cells). IGF-II was measured using the IGF-II ELISA kit from DSL (DSL-10-2600). IGF-II amounts were determined by the standard curve and reported as nanogram IGF-II per 1x10^6 cells.

IGF-II mRNA measurement. RNAs were made from tumor samples and cDNAs were synthesized. Expression of IGF-II was analyzed on 20 ng of cDNA sample in a Fluorogenic 5'-nuclease PCR assay with specific probes and primers using the ABI Prism 7700 Sequence Detection System (Applied Biosystems; Foster City, CA). CT numbers were normalized by determining Ubiquitin (reference gene) mRNA expression in all samples.

IGF2/forward: AGGAGCTCGAGGCGTTCAG (SEQ ID NO: 102)
IGF2/reverse: GTCTTGGGTGGGTAGAGCAATC (SEQ ID NO: 103)
probe: AGGCCAAACGTCACCGTCCCC (SEQ ID NO: 104)

Xenograft models in mice. Four to five million human tumor cells (H322, H838, A2780, ES2, MCF7, SW-527, SK-N-AS, SK-N-MC) in Matrigel were inoculated subcutaneously into each nude mouse. When the tumor size reached at least ~50 mm^3, 19D12/15H12 LCF/HCA treatment was initiated and continued with dosing two times per week. 19D12/15H12 LCF/HCA was injected into each nude mouse, intraperitoneally, at 0.004 mg/mouse, 0.02 mg/mouse, 0.1 mg/mouse or 0.5 mg/mouse. Tumor volumes were measured by Labcat.

IRS-1 phosphorylation level in human lung cancer and normal tissue samples. Twelve pairs of samples of normal and cancerous human lung cancerous tissue samples were obtained from patients. Cell lysates were prepared from the tissue samples and subjected to western blot analysis, staining with anti-phospho-IRS1[pY896] as described above. Total IRS-1 was also measured by staining with an anti-IRS antibody.

The western blot data generated in these experiments is set forth in figure 1. In 6 out of the 12 sample pairs evaluated (50%), greater phospho-IRS-1 levels were observed in tumor tissue samples than in the corresponding normal tissue sample.

Similar results were observed when the level of IRS-1 phosphorylation was measured in normal and cancerous colorectal tissue samples. The colorectal tissue samples were evaluated essentially identically to that way the lung tissue samples were evaluated.

Correlation of In vivo efficacy of 19D12/15H12 LCF/HCA with IRS-1 phosphorylation. To evaluate *in vivo* efficacy of 19D12/15H12 LCF/HCA antibody, nude mice bearing human tumor xenografts were administered the antibody or an isotype control, and tumor volume was evaluated over time as described above.

To evaluate IRS-1 phosphorylation in tumor cell lines, cell lines were grown in the presence of absence of 100 ng/ml IGF-I. Cell lysates of A2780, ES2, H322, H838 and SK-N-AS cells were then prepared and evaluated by western blot analysis as describe above.

The results of the *in vivo* efficacy experiments are set forth in figure 2. The 19D12/15H12 LCF/HCA antibody was found to be effective at inhibiting the growth of several types of tumors *in vivo* (*e.g.*, non-small cell lung cancer, ovarian cancer, breast cancer, neuroblastoma).

The results of the experiments measuring basal and IGF-I stimulated IRS-1 phosphorylation in tumor cells are set forth in figure 3. The A2780, H322 and SK-N-AS

cell lines evaluated exhibited the greatest basal and IGF-I stimulated IRS-1 phosphorylation.

The cell lines that were most sensitive, *in vivo*, to growth inhibition by 19D12/15H12 LCF/HCA (figure 2) were those that showed the greatest basal and IGF-I stimulated IRS-1 phosphorylation (figure 3).

IGF-II mRNA expression level in ovarian and colorectal tumor samples. Normal and cancerous ovarian and colorectal tissue samples were obtained from multiple cancer patients. The level of *IGF-II* mRNA expression was evaluated, by Taqman analysis, as described above. The level of *IGF-II* mRNA expression of each ovarian tissue sample is set forth in figure 4 and the level of IGF-II mRNA expression in each colorectal tissue sample is set forth in figure 5. In these experiments, 20% of ovarian tumor samples were found to overexpress *IGF-II* mRNA as compared to normal ovarian tissue samples. Fifty three percent of colorectal samples were found to overexpress *IGF-II* mRNA as compared with adjacent, normal colorectal samples.

The present invention is not to be limited in scope by the specific embodiments described herein. Indeed, various modifications of the invention in addition to those described herein will become apparent to those skilled in the art from the foregoing description and the accompanying figures. Such modifications are intended to fall within the scope of the appended claims.

Patents, patent applications, Genbank Accession Numbers and publications are cited throughout this application, the disclosures of which are incorporated herein by reference in their entireties.

We Claim:

1. A method for treating a tumor in a patient with cancer comprising

(a) selecting a patient or patient population having a tumor known to express one or more of the following:

(i) IRS-1 phosphorylation on tyrosine 896;
(ii) IRS-1 phosphorylation on tyrosine 612;
(iii) IRS-1 phosphorylation on any tyrosine;
(iv) IGF-II;
(v) IGF1R phosphorylation on any tyrosine; or
(vi) IGF1R; and

(b) administering to said patient a therapeutically effective amount of an IGF1R inhibitory agent.

2. The method of claim 1 wherein the cancer is selected from the group consisting of bladder cancer, Wilm's cancer, bone cancer, prostate cancer, lung cancer, non-small cell lung cancer (NSCLC), colon cancer, rectal cancer, colorectal cancer, endometrial cancer, multiple myeloma, estrogen receptor-positive breast cancer, estrogen receptor-negative breast cancer, cervical cancer, synovial sarcoma, ovarian cancer, pancreatic cancer, neuroblastoma, rhabdomyosarcoma, osteosarcoma and vasoactive intestinal peptide secreting tumors.

3. The method of claim 1 wherein the agent is:

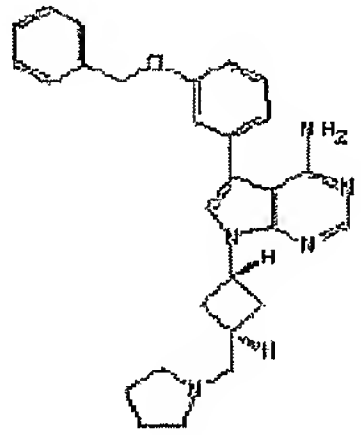
(i) an isolated antibody or antigen-binding fragment thereof that binds specifically to human IGF1R comprising one or more CDRs from a light chain variable region comprising amino acids 20-128 of SEQ ID NO: 8 and/or one or more CDRs from a heavy chain variable region comprising amino acids 20-137 of SEQ ID NO: 10;

(ii) an isolated antibody or antigen-binding fragment thereof that binds specifically to human IGF1R comprising one or more CDRs from a heavy chain immunoglobulin comprising the amino acid sequence of SEQ ID NO: 2, 4, 6, 8, 19-28, 35-38, 43, 45 or 73-98;

(iii) an isolated antibody or antigen-binding fragment thereof that binds specifically to human IGF1R comprising one or more CDRs from a light chain immunoglobulin comprising the amino acid sequence of SEQ ID NO: 10, 12-18, 29-34, 39, 40, 41, 42, 44 or 58-72; or

(iv) an isolated single-chain antibody (scfv) that binds specifically to human IGF1R comprising an amino acid sequence selected from the group consisting of SEQ ID NOs: 46-51; or

(v)



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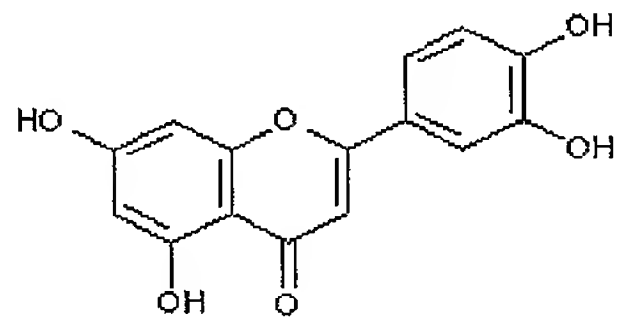

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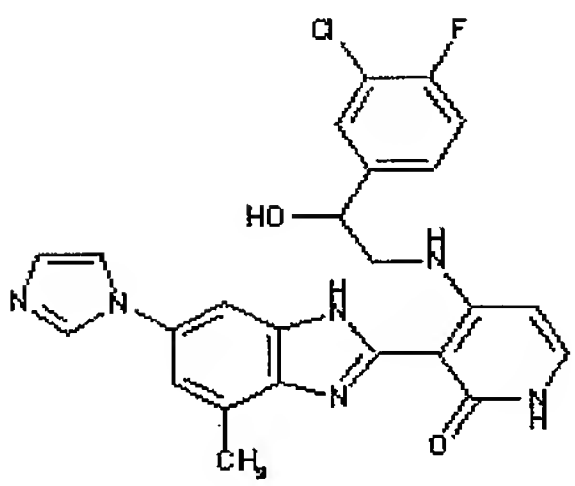


or ATL-1101.

4. The method of claim 3 wherein the isolated antibody or antigen-binding fragment thereof comprises:

(i) an isolated immunoglobulin heavy chain comprising an amino acid sequence selected from the group consisting of SEQ ID NOs: 2, 4, 6, 8, 19-28, 35-38, 43, 45 and 73-98;

(ii) an isolated immunoglobulin light chain comprising an amino acid sequence selected from the group consisting of SEQ ID NOs: 10, 12-18, 29-34, 39, 40, 41, 42, 44 and 58-72;

(iii) an isolated antibody produced by a hybridoma deposited at the American Type Culture Collection under deposit number PTA-2792, PTA-2788, PTA-2790, PTA-2791, PTA-2789 or PTA-2793;

(iv) an isolated antibody or antigen-binding fragment thereof that binds specifically to human IGF1R comprising a light chain variable region comprising amino acids 20-128 of SEQ ID NO: 8 and/or a heavy chain variable region comprising amino acids 20-137 of SEQ ID NO: 10; or

(v) an isolated antibody comprising an immunoglobulin light chain encoded by the plasmid contained in the cell line deposited at the American Type Culture Collection under deposit number PTA-5220 and an immunoglobulin heavy chain encoded by the plasmid contained in a cell line deposited at the American Type Culture Collection under deposit number PTA-5214 or PTA-5216.

5. The method of claim 1 wherein phosphorylation of tyrosine on IRS-1 or IGF1R is determined by western blot analysis, ELISA or flow cytometry analysis.

6. The method of claim 1 wherein IGF-II expression is determined by western blot analysis, ELISA, quantitative PCR or by northern blot analysis.

7. The method of claim 1 wherein IGF1R expression is determined by western blot analysis or ELISA.

8. A method for treating a tumor in a patient with cancer comprising:
(a) selecting a patient having a tumor expressing one or more of the following:

(i) IRS-1 phosphorylation on tyrosine 896;
(ii) IRS-1 phosphorylation on tyrosine 612;
(iii) IRS-1 phosphorylation on any tyrosine;
(iv) IGF-II;
(v) IGF1R phosphorylation on any tyrosine; or
(vi) IGF1R; and

(b) administering to said patient a therapeutically effective amount of an IGF1R inhibitory agent.

9. The method of claim 8 wherein the cancer is selected from the group consisting of bladder cancer, Wilm's cancer, bone cancer, prostate cancer, lung cancer, non-small cell

lung cancer (NSCLC), colon cancer, rectal cancer, colorectal cancer, endometrial cancer, multiple myeloma, estrogen receptor-positive breast cancer, estrogen receptor-negative breast cancer, cervical cancer, synovial sarcoma, ovarian cancer, pancreatic cancer, neuroblastoma, rhabdomyosarcoma, osteosarcoma and vasoactive intestinal peptide secreting tumors.

10. The method of claim 8wherein the agent is:

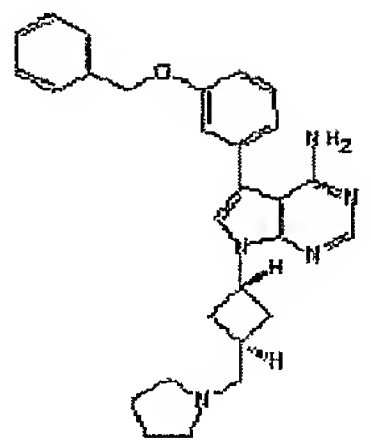
(i) an isolated antibody or antigen-binding fragment thereof that binds specifically to human IGF1R comprising one or more CDRs from a light chain variable region comprising amino acids 20-128 of SEQ ID NO: 8 and/or one or more CDRs from a heavy chain variable region comprising amino acids 20-137 of SEQ ID NO: 10;

(ii) an isolated antibody or antigen-binding fragment thereof that binds specifically to human IGF1R comprising one or more CDRs from a heavy chain immunoglobulin comprising the amino acid sequence of SEQ ID NO: 2, 4, 6, 8, 19-28, 35-38, 43, 45 or 73-98;

(iii) an isolated antibody or antigen-binding fragment thereof that binds specifically to human IGF1R comprising one or more CDRs from a light chain immunoglobulin comprising the amino acid sequence of SEQ ID NO: 10, 12-18, 29-34, 39, 40, 41, 42, 44 or 58-72; or

(iv) an isolated single-chain antibody (scfv) that binds specifically to human IGF1R comprising an amino acid sequence selected from the group consisting of SEQ ID NOs: 46-51; or

(v)



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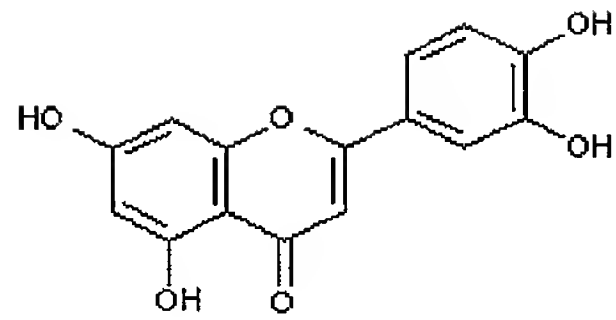

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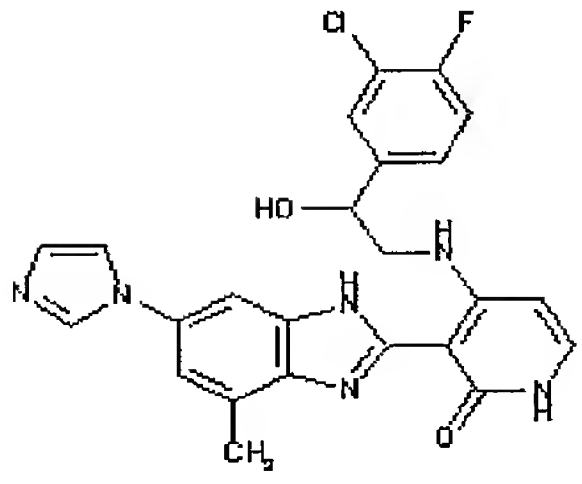


or ATL-1101.

11. The method of claim 10 wherein the isolated antibody or antigen-binding fragment thereof comprises:

(i) an isolated immunoglobulin heavy chain comprising an amino acid sequence selected from the group consisting of SEQ ID NOs: 2, 4, 6, 8, 19-28, 35-38, 43, 45 and 73-98;

(ii) an isolated immunoglobulin light chain comprising an amino acid sequence selected from the group consisting of SEQ ID NOs: 10, 12-18, 29-34, 39, 40, 41, 42, 44 and 58-72;

(iii) an isolated antibody produced by a hybridoma deposited at the American Type Culture Collection under deposit number PTA-2792, PTA-2788, PTA-2790, PTA-2791, PTA-2789 or PTA-2793;

(iv) an isolated antibody or antigen-binding fragment thereof that binds specifically to human IGF1R comprising a light chain variable region comprising amino acids 20-128 of SEQ ID NO: 8 and/or a heavy chain variable region comprising amino acids 20-137 of SEQ ID NO: 10; or

(v) an isolated antibody comprising an immunoglobulin light chain encoded by the plasmid contained in the cell line deposited at the American Type Culture Collection under deposit number PTA-5220 and an immunoglobulin heavy chain encoded by the plasmid contained in a cell line deposited at the American Type Culture Collection under deposit number PTA-5214 or PTA-5216.

12. The method of claim 8 wherein phosphorylation of tyrosine on IRS-1 or IGF1R is determined by western blot analysis, ELISA or flow cytometry analysis.

13. The method of claim 8 wherein IGF-II expression is determined by western blot analysis, ELISA, quantitative PCR or by northern blot analysis.

14. The method of claim 8 wherein IGF1R expression is determined by western blot analysis or ELISA.

15. A method for selecting a therapy for a patient or a patient population with a tumor, comprising:

(a) determining whether the patient's tumor is known to express one or more of the following:

(i) IRS-1 phosphorylation on tyrosine 896;
(ii) IRS-1 phosphorylation on tyrosine 612;
(iii) IRS-1 phosphorylation on any tyrosine;
(iv) IGF-II;
(v) IGF1R phosphorylation on any tyrosine; or
(vi) IGF1R; and

(b) determining whether the patient's tumor expresses one or more of the following:

(i) IRS-1 phosphorylation on tyrosine 896;
(ii) IRS-1 phosphorylation on tyrosine 612;
(iii) IRS-1 phosphorylation on any tyrosine;
(iv) IGF-II;
(v) IGF1R phosphorylation on any tyrosine; or
(vi) IGF1R; and

(c) selecting an IGF1R inhibitory agent as the therapy if the patient's tumor is known to express one or more of (i)-(vi) and/or if the patient's tumor expresses one or more of (i)-(vi).

16. The method of claim 15 wherein the agent is:

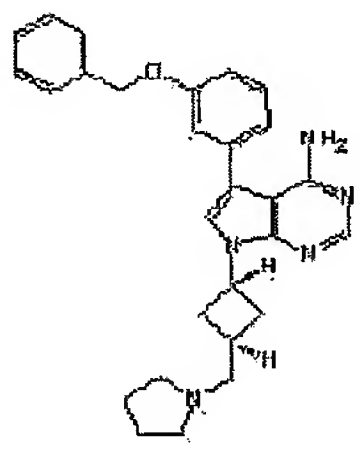
(i) an isolated antibody or antigen-binding fragment thereof that binds specifically to human IGF1R comprising one or more CDRs from a light chain variable region comprising amino acids 20-128 of SEQ ID NO: 8 and/or a one or more CDRs from a heavy chain variable region comprising amino acids 20-137 of SEQ ID NO: 10;

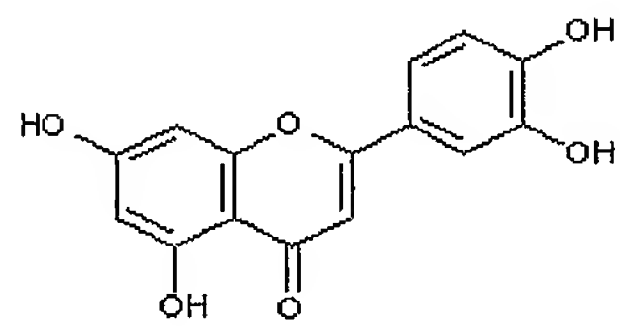
(ii) an isolated antibody or antigen-binding fragment thereof that binds specifically to human IGF1R comprising one or more CDRs from a heavy chain immunoglobulin comprising the amino acid sequence of SEQ ID NO: 2, 4, 6, 8, 19-28, 35-38, 43, 45 or 73-98;

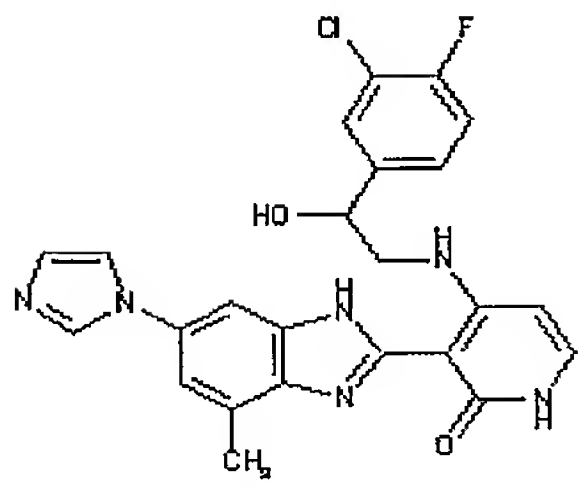
(iii) an isolated antibody or antigen-binding fragment thereof that binds specifically to human IGF1R comprising one or more CDRs from a light chain immunoglobulin comprising the amino acid sequence of SEQ ID NO: 10, 12-18, 29-34, 39, 40, 41, 42, 44 or 58-72; or

(iv) an isolated single-chain antibody (scfv) that binds specifically to human IGF1R comprising an amino acid sequence selected from the group consisting of SEQ ID NOs: 46-51; or

(v)







or ATL-1101.

17. The method of claim 16 wherein the isolated antibody or antigen-binding fragment thereof comprises:

(i) an isolated immunoglobulin heavy chain comprising an amino acid sequence selected from the group consisting of SEQ ID NOs: 2, 4, 6, 8, 19-28, 35-38, 43, 45 and 73-98;

(ii) an isolated immunoglobulin light chain comprising an amino acid sequence selected from the group consisting of SEQ ID NOs: 10, 12-18, 29-34, 39, 40, 41, 42, 44 and 58-72;

(iii) an isolated antibody produced by a hybridoma deposited at the American Type Culture Collection under deposit number PTA-2792, PTA-2788, PTA-2790, PTA-2791, PTA-2789 or PTA-2793;

(iv) an isolated antibody or antigen-binding fragment thereof that binds specifically to human IGF1R comprising a light chain variable region comprising amino acids 20-128 of SEQ ID NO: 8 and/or a heavy chain variable region comprising amino acids 20-137 of SEQ ID NO: 10; or

(v) an isolated antibody comprising an immunoglobulin light chain encoded by the plasmid contained in the cell line deposited at the American Type Culture Collection under deposit number PTA-5220 and an immunoglobulin heavy chain encoded by the plasmid contained in a cell line deposited at the American Type Culture Collection under deposit number PTA-5214 or PTA-5216.

18. The method of claim 12 wherein phosphorylation of tyrosine on IRS-1 or IGF1R is determined by western blot analysis, ELISA or flow cytometry analysis.

19. The method of claim 12 wherein IGF-II expression is determined by western blot analysis, ELISA, quantitative PCR or by northern blot analysis.

20. The method of claim 12 wherein IGF1R expression is determined by western blot analysis or ELISA.

21. A method for advertising an IGF1R inhibitory agent or a pharmaceutically acceptable composition thereof comprising promoting, to a target audience, the use of the agent or pharmaceutical composition thereof for treating a patient or patient population whose tumors express or are known to express one or more of the following:

(i) IRS-1 phosphorylation on tyrosine 896;

(ii) IRS-1 phosphorylation on tyrosine 612;

(iii) IRS-1 phosphorylation on any tyrosine;

(iv) IGF-II;

(v) IGF1R phosphorylation on any tyrosine; or

(vi) IGF1R.

22. The method of claim 21 wherein the agent is:

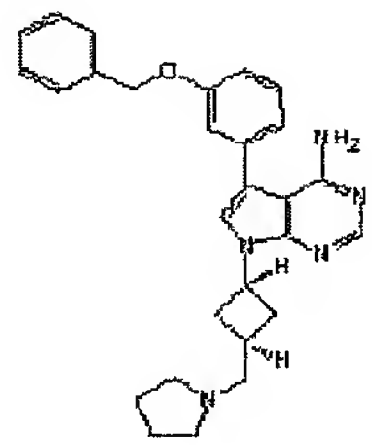
(i) an isolated antibody or antigen-binding fragment thereof that binds specifically to human IGF1R comprising one or more CDRs from a light chain variable region comprising amino acids 20-128 of SEQ ID NO: 8 and/or one or more CDRs from a heavy chain variable region comprising amino acids 20-137 of SEQ ID NO: 10;

(ii) an isolated antibody or antigen-binding fragment thereof that binds specifically to human IGF1R comprising one or more CDRs from a heavy chain immunoglobulin comprising the amino acid sequence of SEQ ID NO: 2, 4, 6, 8, 19-28, 35-38, 43, 45 or 73-98;

(iii) an isolated antibody or antigen-binding fragment thereof that binds specifically to human IGF1R comprising one or more CDRs from a light chain immunoglobulin comprising the amino acid sequence of SEQ ID NO: 10, 12-18, 29-34, 39, 40, 41, 42, 44 or 58-72; or

(iv) an isolated single-chain antibody (scfv) that binds specifically to human IGF1R comprising an amino acid sequence selected from the group consisting of SEQ ID NOs: 46-51; or

(v)



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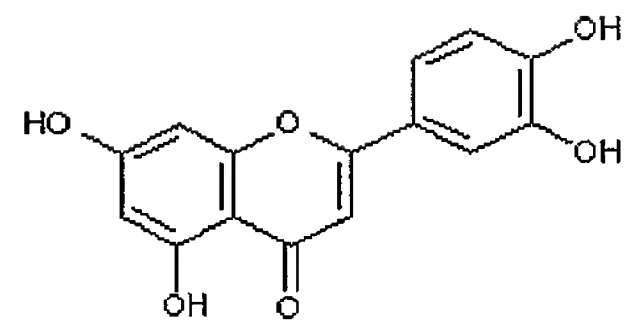

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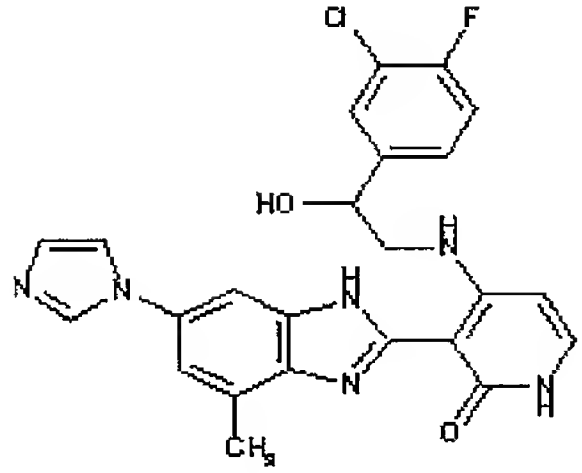


or ATL-1101.

23. The method of claim 22 wherein the isolated antibody or antigen-binding fragment thereof comprises:

(i) an isolated immunoglobulin heavy chain comprising an amino acid sequence selected from the group consisting of SEQ ID NOs: 2, 4, 6, 8, 19-28, 35-38, 43, 45 and 73-98;

(ii) an isolated immunoglobulin light chain comprising an amino acid sequence selected from the group consisting of SEQ ID NOs: 10, 12-18, 29-34, 39, 40, 41, 42, 44 and 58-72;

(iii) an isolated antibody produced by a hybridoma deposited at the American Type Culture Collection under deposit number PTA-2792, PTA-2788, PTA-2790, PTA-2791, PTA-2789 or PTA-2793;

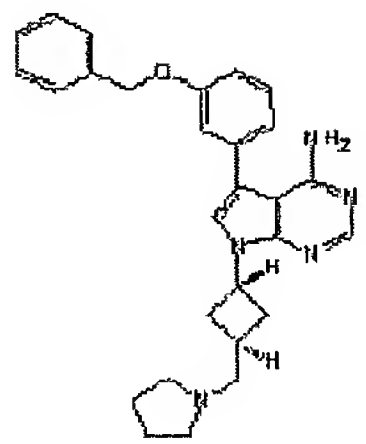
(iv) an isolated antibody or antigen-binding fragment thereof that binds specifically to human IGF1R comprising a light chain variable region comprising amino acids 20-128 of SEQ ID NO: 8 and/or a heavy chain variable region comprising amino acids 20-137 of SEQ ID NO: 10; or

(v) an isolated antibody comprising an immunoglobulin light chain encoded by the plasmid contained in the cell line deposited at the American Type Culture Collection under deposit number PTA-5220 and an immunoglobulin heavy chain encoded by the plasmid contained in a cell line deposited at the American Type Culture Collection under deposit number PTA-5214 or PTA-5216.

24. An article of manufacture comprising, packaged together, a pharmaceutical composition comprising an IGF1R inhibitory agent and a pharmaceutically acceptable carrier and a label stating that the agent or pharmaceutical composition is indicated for treating patients having a tumor expressing or known to express one or more of the following:

(i) IRS-1 phosphorylation on tyrosine 896;
(ii) IRS-1 phosphorylation on tyrosine 612;
(iii) IRS-1 phosphorylation on any tyrosine;
(iv) IGF-II;
(v) IGF1R phosphorylation on any tyrosine; or
(vi) IGF1R.

25. The article of claim 24 wherein the agent is:
(i) an isolated antibody or antigen-binding fragment thereof that binds specifically to human IGF1R comprising one or more CDRs from a light chain variable region comprising amino acids 20-128 of SEQ ID NO: 8 and/or a one or more CDRs from a heavy chain variable region comprising amino acids 20-137 of SEQ ID NO: 10;
(ii) an isolated antibody or antigen-binding fragment thereof that binds specifically to human IGF1R comprising one or more CDRs from a heavy chain immunoglobulin comprising the amino acid sequence of SEQ ID NO: 2, 4, 6, 8, 19-28, 35-38, 43, 45 or 73-98;
(iii) an isolated antibody or antigen-binding fragment thereof that binds specifically to human IGF1R comprising one or more CDRs from a light chain immunoglobulin comprising the amino acid sequence of SEQ ID NO: 10, 12-18, 29-34, 39, 40, 41, 42, 44 or 58-72; or
(iv) an isolated single-chain antibody (scfv) that binds specifically to human IGF1R comprising an amino acid sequence selected from the group consisting of SEQ ID NOs: 46-51; or
(v)



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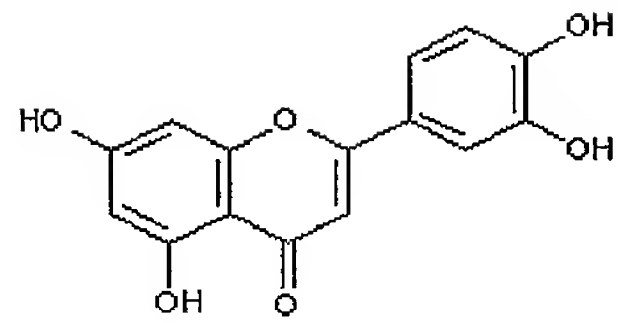

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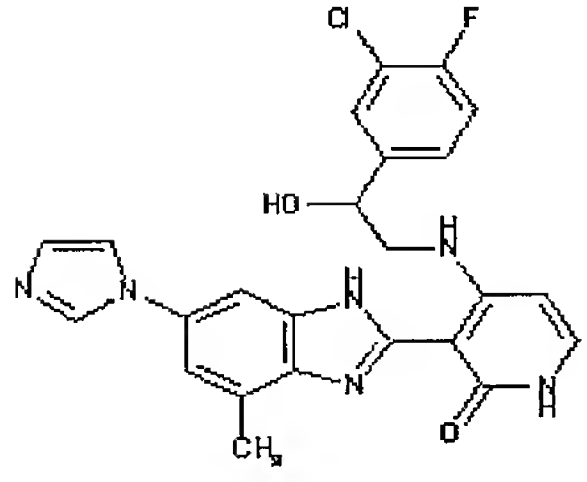


or ATL-1101.

26. The method of claim 25 wherein the isolated antibody or antigen-binding fragment thereof comprises:

(i) an isolated immunoglobulin heavy chain comprising an amino acid sequence selected from the group consisting of SEQ ID NOs: 2, 4, 6, 8, 19-28, 35-38, 43, 45 and 73-98;

(ii) an isolated immunoglobulin light chain comprising an amino acid sequence selected from the group consisting of SEQ ID NOs: 10, 12-18, 29-34, 39, 40, 41, 42, 44 and 58-72;

(iii) an isolated antibody produced by a hybridoma deposited at the American Type Culture Collection under deposit number PTA-2792, PTA-2788, PTA-2790, PTA-2791, PTA-2789 or PTA-2793;

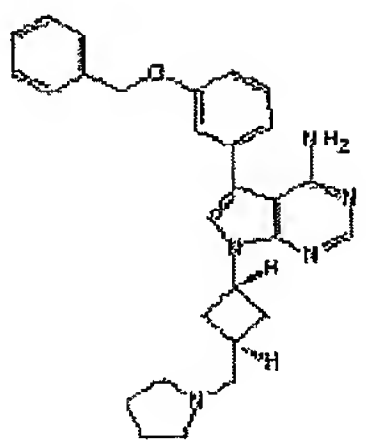
(iv) an isolated antibody or antigen-binding fragment thereof that binds specifically to human IGF1R comprising a light chain variable region comprising amino acids 20-128 of SEQ ID NO: 8 and/or a heavy chain variable region comprising amino acids 20-137 of SEQ ID NO: 10; or

(v) an isolated antibody comprising an immunoglobulin light chain encoded by the plasmid contained in the cell line deposited at the American Type Culture Collection under deposit number PTA-5220 and an immunoglobulin heavy chain encoded by the plasmid contained in a cell line deposited at the American Type Culture Collection under deposit number PTA-5214 or PTA-5216.

27. A method for manufacturing an IGF1R inhibitory agent or a pharmaceutical composition thereof comprising combining in a package the agent or pharmaceutical composition and a label stating that the agent or pharmaceutical composition is indicated for treating patients having a tumor expressing or known to express one or more of the following:

(i) IRS-1 phosphorylation on tyrosine 896;
(ii) IRS-1 phosphorylation on tyrosine 612;
(iii) IRS-1 phosphorylation on any tyrosine;
(iv) IGF-II;
(v) IGF1R phosphorylation on any tyrosine; or
(vi) IGF1R.

28. The method of claim 27 wherein the agent is:
(i) an isolated antibody or antigen-binding fragment thereof that binds specifically to human IGF1R comprising one or more CDRs from a light chain variable region comprising amino acids 20-128 of SEQ ID NO: 8 and/or a one or more CDRs from a heavy chain variable region comprising amino acids 20-137 of SEQ ID NO: 10;
(ii) an isolated antibody or antigen-binding fragment thereof that binds specifically to human IGF1R comprising one or more CDRs from a heavy chain immunoglobulin comprising the amino acid sequence of SEQ ID NO: 2, 4, 6, 8, 19-28, 35-38, 43, 45 or 73-98;
(iii) an isolated antibody or antigen-binding fragment thereof that binds specifically to human IGF1R comprising one or more CDRs from a light chain immunoglobulin comprising the amino acid sequence of SEQ ID NO: 10, 12-18, 29-34, 39, 40, 41, 42, 44 or 58-72; or
(iv) an isolated single-chain antibody (scfv) that binds specifically to human IGF1R comprising an amino acid sequence selected from the group consisting of SEQ ID NOs: 46-51; or
(v)



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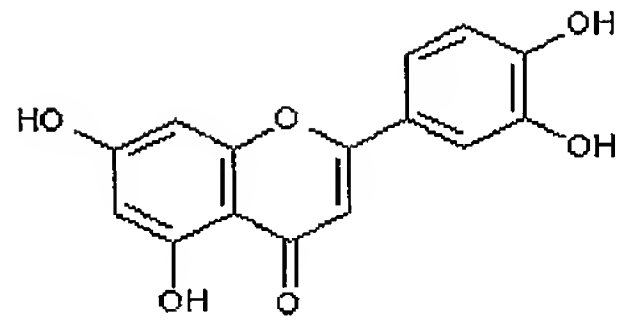

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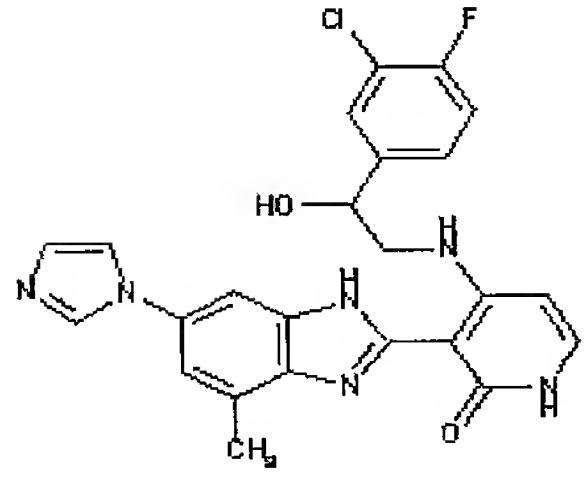


or ATL-1101.

29. The method of claim 28 wherein the isolated antibody or antigen-binding fragment thereof comprises:

(i) an isolated immunoglobulin heavy chain comprising an amino acid sequence selected from the group consisting of SEQ ID NOs: 2, 4, 6, 8, 19-28, 35-38, 43, 45 and 73-98;

(ii) an isolated immunoglobulin light chain comprising an amino acid sequence selected from the group consisting of SEQ ID NOs: 10, 12-18, 29-34, 39, 40, 41, 42, 44 and 58-72;

(iii) an isolated antibody produced by a hybridoma deposited at the American Type Culture Collection under deposit number PTA-2792; PTA-2788, PTA-2790, PTA-2791, PTA-2789 or PTA-2793;

(iv) an isolated antibody or antigen-binding fragment thereof that binds specifically to human IGF1R comprising a light chain variable region comprising amino acids 20-128 of SEQ ID NO: 8 and/or a heavy chain variable region comprising amino acids 20-137 of SEQ ID NO: 10; or

(v) an isolated antibody comprising an immunoglobulin light chain encoded by the plasmid contained in the cell line deposited at the American Type Culture Collection under deposit number PTA-5220 and an immunoglobulin heavy chain encoded by the plasmid contained in a cell line deposited at the American Type Culture Collection under deposit number PTA-5214 or PTA-5216.

30. A method for identifying a patient whose tumor is likely to be responsive to an IGF1R inhibitory agent comprising:

(a) determining whether the patient has a tumor known to express one or more of the following:

(i) IRS-1 phosphorylation on tyrosine 896;

(ii) IRS-1 phosphorylation on tyrosine 612;

(iii) IRS-1 phosphorylation on any tyrosine;

(iv) IGF-II;

(v) IGF1R phosphorylation on any tyrosine; or

(vi) IGF1R; and/or

(b) determining whether the patient has a tumor expressing one or more of the following:

(i) IRS-1 phosphorylation on tyrosine 896;

(ii) IRS-1 phosphorylation on tyrosine 612;

(iii) IRS-1 phosphorylation on any tyrosine;

(iv) IGF-II;

(v) IGF1R phosphorylation on any tyrosine; or

(vi) IGF1R.

31. The method of claim 30 wherein the agent is:

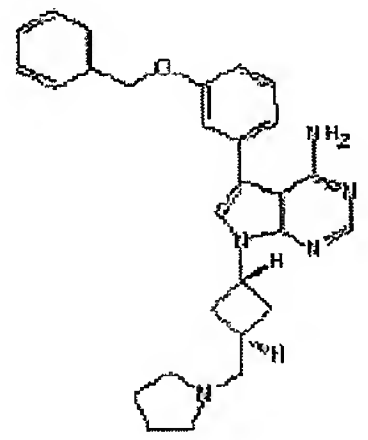
(i) an isolated antibody or antigen-binding fragment thereof that binds specifically to human IGF1R comprising one or more CDRs from a light chain variable region comprising amino acids 20-128 of SEQ ID NO: 8 and/or a one or more CDRs from a heavy chain variable region comprising amino acids 20-137 of SEQ ID NO: 10;

(ii) an isolated antibody or antigen-binding fragment thereof that binds specifically to human IGF1R comprising one or more CDRs from a heavy chain immunoglobulin comprising the amino acid sequence of SEQ ID NO: 2, 4, 6, 8, 19-28, 35-38, 43, 45 or 73-98;

(iii) an isolated antibody or antigen-binding fragment thereof that binds specifically to human IGF1R comprising one or more CDRs from a light chain immunoglobulin comprising the amino acid sequence of SEQ ID NO: 10, 12-18, 29-34, 39, 40, 41, 42, 44 or 58-72; or

(iv) an isolated single-chain antibody (scfv) that binds specifically to human IGF1R comprising an amino acid sequence selected from the group consisting of SEQ ID NOs: 46-51; or

(v)



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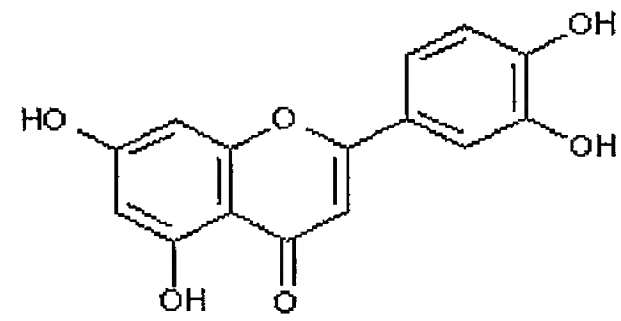

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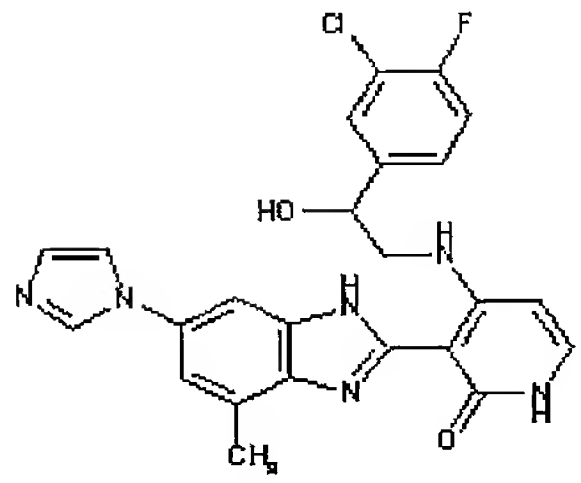


or ATL-1101.

32. The method of claim 31 wherein the isolated antibody or antigen-binding fragment thereof comprises:

(i) an isolated immunoglobulin heavy chain comprising an amino acid sequence selected from the group consisting of SEQ ID NOs: 2, 4, 6, 8, 19-28, 35-38, 43, 45 and 73-98;

(ii) an isolated immunoglobulin light chain comprising an amino acid sequence selected from the group consisting of SEQ ID NOs: 10, 12-18, 29-34, 39, 40, 41, 42, 44 and 58-72;

(iii) an isolated antibody produced by a hybridoma deposited at the American Type Culture Collection under deposit number PTA-2792, PTA-2788, PTA-2790, PTA-2791, PTA-2789 or PTA-2793;

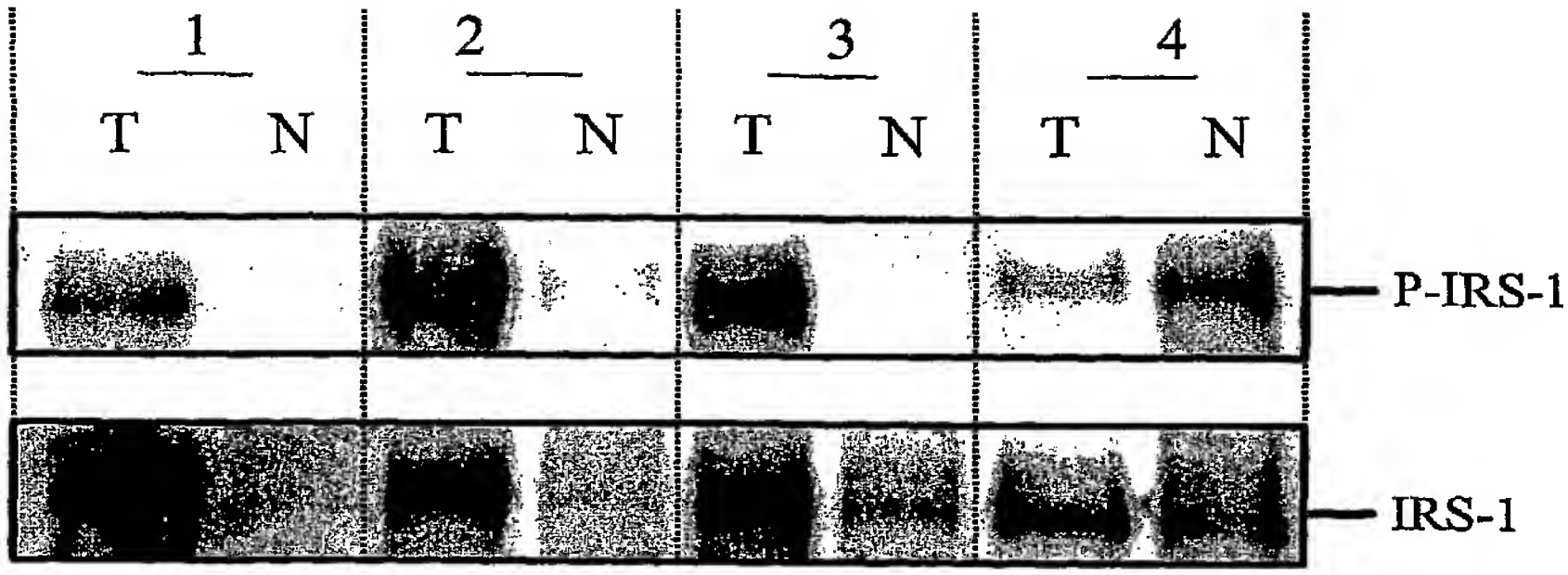
(iv) an isolated antibody or antigen-binding fragment thereof that binds specifically to human IGF1R comprising a light chain variable region comprising amino acids 20-128 of SEQ ID NO: 8 and/or a heavy chain variable region comprising amino acids 20-137 of SEQ ID NO: 10; or

(v) an isolated antibody comprising an immunoglobulin light chain encoded by the plasmid contained in the cell line deposited at the American Type Culture Collection under deposit number PTA-5220 and an immunoglobulin heavy chain encoded by the plasmid contained in a cell line deposited at the American Type Culture Collection under deposit number PTA-5214 or PTA-5216.

33. The method of claim 30 wherein phosphorylation of tyrosine on IRS-1 or IGF1R is determined by western blot analysis, ELISA or flow cytometry analysis.

34. The method of claim 30 wherein IGF-II expression is determined by western blot analysis, ELISA, quantitative PCR or by northern blot analysis.

35. The method of claim 30 wherein IGF1R expression is determined by western blot analysis or ELISA.


1
2
3
4
T N T N T N T N
P-IRS-1
IRS-1

Tumor Type	Cell Line	Maximal Tumor Growth Inhibition
NSCLC	H322	64-102%
NSCLC	H838	24%
Ovarian	A2780	56-63%
Ovarian	ES2	30%
Breast (ER+)	MCF7	68%
Breast (ER-)	SW-527	56%
Neuroblastoma	SK-N-AS	82-87%
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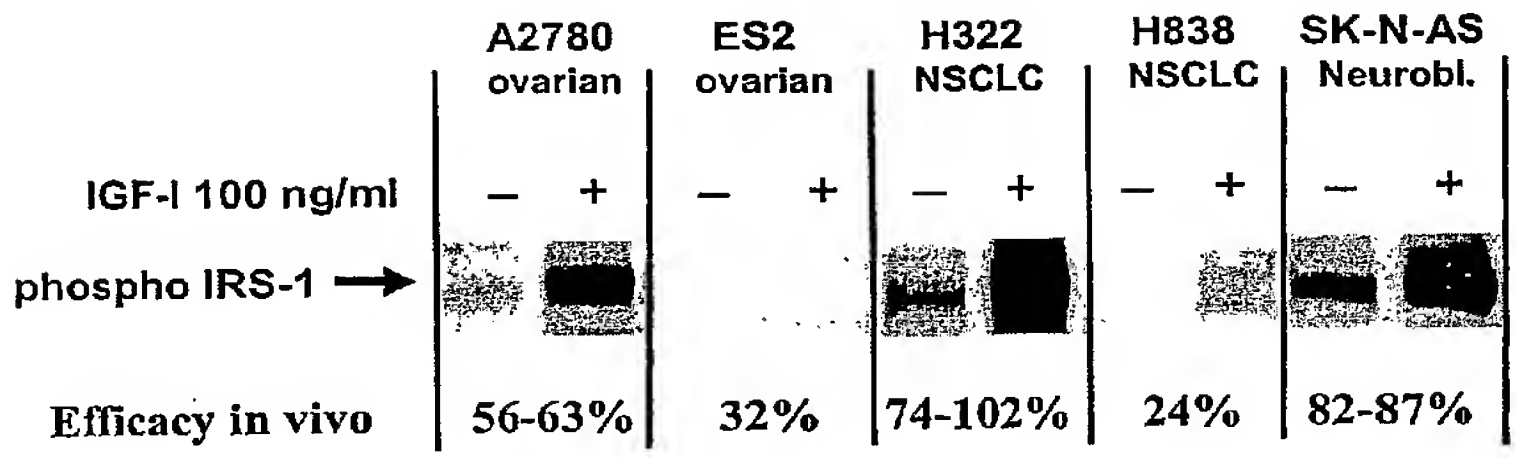
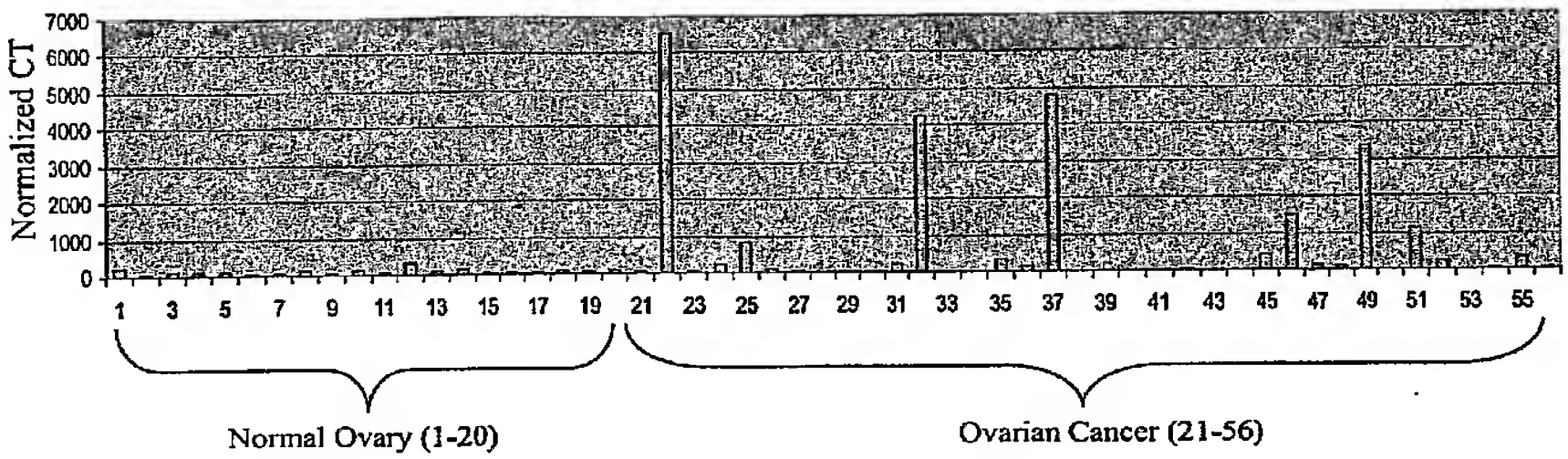

A2780
ovarian
ES2
ovarian
H322
NSCLC
H838
NSCLC
SK-N-AS
Neurobl.
IGF-I 100 ng/ml
– + – + – + – + – +
phospho IRS-1
Efficacy in vivo
56-63%
32%
74-102%
24%
82-87%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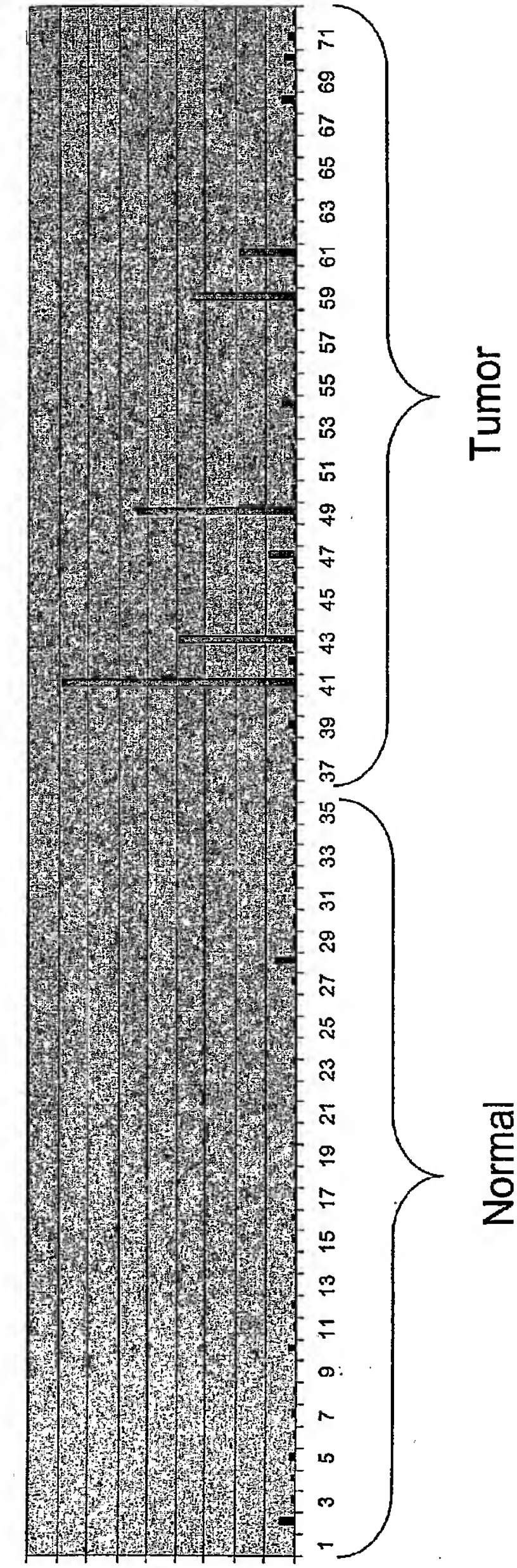
Normal Ovary (1-20)
Ovarian Cancer (21-56)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Normal
Tumor

Fig. 5

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Ser Arg Gly Glu Ile Val Leu Thr Gln Ser Pro Asp Ser Leu Ser Val
            20                  25                  30

act cca ggc gag aga gtc acc atc acc tgc cgg gcc agt cag agc att       144
Thr Pro Gly Glu Arg Val Thr Ile Thr Cys Arg Ala Ser Gln Ser Ile
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ggt agt agc tta cac tgg tac cag cag aaa cca ggt cag tct cca aag       192
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                85                  90                  95

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Leu Glu Ala Glu Asp Phe Ala Val Tyr Tyr Cys His Gln Ser Ser Arg
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65 70 75 80

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Met Ser Pro Ser Gln Leu Ile Gly Phe Leu Leu Leu Trp Val Pro Ala
1 5 10 15

tcc agg ggt gaa att gtg ctg act cag agc cca ggt acc ctg tct gtg 96
Ser Arg Gly Glu Ile Val Leu Thr Gln Ser Pro Gly Thr Leu Ser Val
20 25 30

tct cca ggc gag aga gcc acc ctc tcc tgc cgg gcc agt cag agc att 144
Ser Pro Gly Glu Arg Ala Thr Leu Ser Cys Arg Ala Ser Gln Ser Ile
35 40 45

ggt agt agc tta cac tgg tac cag cag aaa cca ggt cag gct cca agg 192
Gly Ser Ser Leu His Trp Tyr Gln Gln Lys Pro Gly Gln Ala Pro Arg
50 55 60

ctt ctc atc aag tat gca tcc cag tcc ctc tca ggg atc ccc gat agg 240
Leu Leu Ile Lys Tyr Ala Ser Gln Ser Leu Ser Gly Ile Pro Asp Arg
65 70 75 80

ttc agt ggc agt gga tct ggg aca gat ttc acc ctc acc atc agt aga 288
Phe Ser Gly Ser Gly Ser Gly Thr Asp Phe Thr Leu Thr Ile Ser Arg
85 90 95

ctg gag cct gaa gat ttc gca gtg tat tac tgt cat cag agt agt cgt 336
Leu Glu Pro Glu Asp Phe Ala Val Tyr Tyr Cys His Gln Ser Ser Arg
100 105 110

tta cct cac act ttc ggc caa ggg acc aag gtg gag atc aaa cgt aca 384
Leu Pro His Thr Phe Gly Gln Gly Thr Lys Val Glu Ile Lys Arg Thr
115 120 125

<210> 8
<211> 128
<212> PRT
<213> Artificial Sequence
<220>
<223> Synthetic Construct

<400> 8

Met Ser Pro Ser Gln Leu Ile Gly Phe Leu Leu Leu Trp Val Pro Ala
1 5 10 15

Ser Arg Gly Glu Ile Val Leu Thr Gln Ser Pro Gly Thr Leu Ser Val
20 25 30

Ser Pro Gly Glu Arg Ala Thr Leu Ser Cys Arg Ala Ser Gln Ser Ile
35 40 45

Gly Ser Ser Leu His Trp Tyr Gln Gln Lys Pro Gly Gln Ala Pro Arg
50 55 60

Leu Leu Ile Lys Tyr Ala Ser Gln Ser Leu Ser Gly Ile Pro Asp Arg
65 70 75 80

Phe Ser Gly Ser Gly Ser Gly Thr Asp Phe Thr Leu Thr Ile Ser Arg
85 90 95

Leu Glu Pro Glu Asp Phe Ala Val Tyr Tyr Cys His Gln Ser Ser Arg
100 105 110

Leu Pro His Thr Phe Gly Gln Gly Thr Lys Val Glu Ile Lys Arg Thr
115 120 125

<210> 9
<211> 411
<212> DNA
<213> Artificial Sequence

<220>
<223> 19D12/15H12 heavy chain-A

<220>
<221> CDS
<222> (1)..(411)

<400> 9
atg gag ttt ggg ctg agc tgg gtt ttc ctt gtt gct ata tta aaa ggt 48
Met Glu Phe Gly Leu Ser Trp Val Phe Leu Val Ala Ile Leu Lys Gly
1 5 10 15

gtc cag tgt gag gtt cag ctg gtg cag tct ggg gga ggc ttg gta aag 96
Val Gln Cys Glu Val Gln Leu Val Gln Ser Gly Gly Gly Leu Val Lys
20 25 30

cct ggg ggg tcc ctg aga ctc tcc tgt gca gcc tct gga ttc acc ttc 144
Pro Gly Gly Ser Leu Arg Leu Ser Cys Ala Ala Ser Gly Phe Thr Phe
35 40 45

agt agc ttt gct atg cac tgg gtt cgc cag gct cca gga aaa ggt ctg 192
Ser Ser Phe Ala Met His Trp Val Arg Gln Ala Pro Gly Lys Gly Leu
50 55 60

gag tgg ata tca gtt att gat act cgt ggt gcc aca tac tat gca gac 240
Glu Trp Ile Ser Val Ile Asp Thr Arg Gly Ala Thr Tyr Tyr Ala Asp
65 70 75 80

tcc gtg aag ggc cga ttc acc atc tcc aga gac aat gcc aag aac tcc 288
Ser Val Lys Gly Arg Phe Thr Ile Ser Arg Asp Asn Ala Lys Asn Ser
85 90 95

```
ttg tat ctt caa atg aac agc ctg aga gcc gag gac act gct gtg tat      336
Leu Tyr Leu Gln Met Asn Ser Leu Arg Ala Glu Asp Thr Ala Val Tyr
            100                 105                 110

tac tgt gca aga ctg ggg aac ttc tac tac ggt atg gac gtc tgg ggc      384
Tyr Cys Ala Arg Leu Gly Asn Phe Tyr Tyr Gly Met Asp Val Trp Gly
        115                 120                 125

caa ggg acc acg gtc acc gtc tcc tca                                  411
Gln Gly Thr Thr Val Thr Val Ser Ser
    130                 135
```

<210> 10
<211> 137
<212> PRT
<213> Artificial Sequence

<220>
<223> Synthetic Construct

<400> 10

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Met Glu Phe Gly Leu Ser Trp Val Phe Leu Val Ala Ile Leu Lys Gly
1               5                   10                  15

Val Gln Cys Glu Val Gln Leu Val Gln Ser Gly Gly Gly Leu Val Lys
            20                  25                  30

Pro Gly Gly Ser Leu Arg Leu Ser Cys Ala Ala Ser Gly Phe Thr Phe
        35                  40                  45

Ser Ser Phe Ala Met His Trp Val Arg Gln Ala Pro Gly Lys Gly Leu
    50                  55                  60

Glu Trp Ile Ser Val Ile Asp Thr Arg Gly Ala Thr Tyr Tyr Ala Asp
65                  70                  75                  80

Ser Val Lys Gly Arg Phe Thr Ile Ser Arg Asp Asn Ala Lys Asn Ser
                85                  90                  95

Leu Tyr Leu Gln Met Asn Ser Leu Arg Ala Glu Asp Thr Ala Val Tyr
            100                 105                 110

Tyr Cys Ala Arg Leu Gly Asn Phe Tyr Tyr Gly Met Asp Val Trp Gly
        115                 120                 125

Gln Gly Thr Thr Val Thr Val Ser Ser
    130                 135
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<210> 11
<211> 411
<212> DNA
<213> Artificial Sequence

<220>
<223> Modified 19D12/15H12 heavy chain-B

<220>
<221> CDS
<222> (1)..(411)

<400> 11

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atg gag ttt ggg ctg agc tgg gtt ttc ctt gtt gct ata tta aaa ggt      48
Met Glu Phe Gly Leu Ser Trp Val Phe Leu Val Ala Ile Leu Lys Gly
1               5                  10                  15

gtc cag tgt gag gtt cag ctg gtg cag tct ggg gga ggc ttg gta cag      96
Val Gln Cys Glu Val Gln Leu Val Gln Ser Gly Gly Gly Leu Val Gln
            20                  25                  30

ccc ggg ggg tcc ctg aga ctc tcc tgt gca gcc tct gga ttc acc ttc     144
Pro Gly Gly Ser Leu Arg Leu Ser Cys Ala Ala Ser Gly Phe Thr Phe
        35                  40                  45

agt agc ttt gct atg cac tgg gtt cgc cag gct cca gga aaa ggt ctg     192
Ser Ser Phe Ala Met His Trp Val Arg Gln Ala Pro Gly Lys Gly Leu
    50                  55                  60

gag tgg ata tca gtt att gat act cgt ggt gcc aca tac tat gca gac     240
Glu Trp Ile Ser Val Ile Asp Thr Arg Gly Ala Thr Tyr Tyr Ala Asp
65                  70                  75                  80

tcc gtg aag ggc cga ttc acc atc tcc aga gac aat gcc aag aac tcc     288
Ser Val Lys Gly Arg Phe Thr Ile Ser Arg Asp Asn Ala Lys Asn Ser
                85                  90                  95

ttg tat ctt caa atg aac agc ctg aga gcc gag gac act gct gtg tat     336
Leu Tyr Leu Gln Met Asn Ser Leu Arg Ala Glu Asp Thr Ala Val Tyr
            100                 105                 110

tac tgt gca aga ctg ggg aac ttc tac tac ggt atg gac gtc tgg ggc     384
Tyr Cys Ala Arg Leu Gly Asn Phe Tyr Tyr Gly Met Asp Val Trp Gly
        115                 120                 125

caa ggg acc acg gtc acc gtc tcc tca                                411
Gln Gly Thr Thr Val Thr Val Ser Ser
    130                 135
```

<210> 12
<211> 137
<212> PRT
<213> Artificial Sequence

<220>
<223> Synthetic Construct

<400> 12

Met Glu Phe Gly Leu Ser Trp Val Phe Leu Val Ala Ile Leu Lys Gly
1 5 10 15

Val Gln Cys Glu Val Gln Leu Val Gln Ser Gly Gly Gly Leu Val Gln
20 25 30

Pro Gly Gly Ser Leu Arg Leu Ser Cys Ala Ala Ser Gly Phe Thr Phe
35 40 45

Ser Ser Phe Ala Met His Trp Val Arg Gln Ala Pro Gly Lys Gly Leu
50 55 60

Glu Trp Ile Ser Val Ile Asp Thr Arg Gly Ala Thr Tyr Tyr Ala Asp
65 70 75 80

Ser Val Lys Gly Arg Phe Thr Ile Ser Arg Asp Asn Ala Lys Asn Ser
85 90 95

Leu Tyr Leu Gln Met Asn Ser Leu Arg Ala Glu Asp Thr Ala Val Tyr
100 105 110

Tyr Cys Ala Arg Leu Gly Asn Phe Tyr Tyr Gly Met Asp Val Trp Gly
115 120 125

Gln Gly Thr Thr Val Thr Val Ser Ser
130 135

<210> 13
<211> 174
<212> PRT
<213> Artificial Sequence

<220>
<223> immunoglobulin heavy chain variable region

<400> 13

Gly Arg Leu Gly Gln Ala Trp Arg Ser Leu Arg Leu Ser Cys Ala Ala
1 5 10 15

Ser Gly Phe Thr Phe Ser Asp Tyr Tyr Met Ser Trp Ile Arg Gln Ala
20 25 30

Pro Gly Lys Gly Leu Glu Trp Val Ser Tyr Ile Ser Ser Ser Gly Ser
35 40 45

Thr Arg Asp Tyr Ala Asp Ser Val Lys Gly Arg Phe Thr Ile Ser Arg
50 55 60

Asp Asn Ala Lys Asn Ser Leu Tyr Leu Gln Met Asn Ser Leu Arg Ala
65 70 75 80

Glu Asp Thr Ala Val Tyr Tyr Cys Val Arg Asp Gly Val Glu Thr Thr
85 90 95

Phe Tyr Tyr Tyr Tyr Tyr Gly Met Asp Val Trp Gly Gln Gly Thr Thr
100 105 110

Val Thr Val Ser Ser Ala Ser Thr Lys Gly Pro Ser Val Phe Pro Leu
115 120 125

Ala Pro Cys Ser Arg Ser Thr Ser Glu Ser Thr Ala Ala Leu Gly Cys
130 135 140

Leu Val Lys Asp Tyr Phe Pro Glu Pro Val Thr Val Ser Trp Asn Ser
145 150 155 160

Gly Ala Leu Thr Ser Gly Val His Thr Phe Pro Ser Cys Ala
165 170

<210> 14
<211> 124
<212> PRT
<213> Artificial Sequence

<220>
<223> immunoglobulin heavy chain variable region

<400> 14

Val Gln Leu Leu Glu Ser Gly Gly Gly Leu Val Gln Pro Gly Gly Ser
1 5 10 15

Leu Arg Leu Ser Cys Thr Ala Ser Gly Phe Thr Phe Ser Ser Tyr Ala
20 25 30

Met Asn Trp Val Arg Gln Ala Pro Gly Lys Gly Leu Glu Trp Val Ser
35 40 45

Ala Ile Ser Gly Ser Gly Gly Thr Thr Phe Tyr Ala Asp Ser Val Lys
50 55 60

Gly Arg Phe Thr Ile Ser Arg Asp Asn Ser Arg Thr Thr Leu Tyr Leu
65 70 75 80

Gln Met Asn Ser Leu Arg Ala Glu Asp Thr Ala Val Tyr Tyr Cys Ala
85 90 95

Lys Asp Leu Gly Trp Ser Asp Ser Tyr Tyr Tyr Tyr Tyr Gly Met Asp
100 105 110

Val Trp Gly Gln Gly Thr Thr Val Thr Val Ser Ser
115 120

<210> 15
<211> 112
<212> PRT
<213> Artificial Sequence

<220>
<223> immunoglobulin heavy chain variable region

<400> 15

Gly Pro Gly Leu Val Lys Pro Ser Glu Thr Leu Ser Leu Thr Cys Thr
1 5 10 15

Val Ser Gly Gly Ser Ile Ser Asn Tyr Tyr Trp Ser Trp Ile Arg Gln
20 25 30

Pro Ala Gly Lys Gly Leu Glu Trp Ile Gly Arg Ile Tyr Thr Ser Gly
35 40 45

Ser Pro Asn Tyr Asn Pro Ser Leu Lys Ser Arg Val Thr Met Ser Val
50 55 60

Asp Thr Ser Lys Asn Gln Phe Ser Leu Lys Leu Asn Ser Val Thr Ala
65 70 75 80

Ala Asp Thr Ala Val Tyr Tyr Cys Ala Val Thr Ile Phe Gly Val Val
85 90 95

Ile Ile Phe Asp Tyr Trp Gly Gln Gly Thr Leu Val Thr Val Ser Ser
100 105 110

<210> 16

<211> 125
<212> PRT
<213> Artificial Sequence

<220>
<223> immunoglobulin heavy chain variable region

<400> 16

Glu Val Gln Leu Leu Glu Ser Gly Gly Gly Leu Val Gln Pro Gly Gly
1 5 10 15

Ser Leu Arg Leu Ser Cys Ala Ala Ser Gly Phe Thr Phe Ser Ser Tyr
20 25 30

Ala Met Ser Trp Val Arg Gln Ala Pro Gly Lys Gly Leu Glu Trp Val
35 40 45

Ser Ala Ile Ser Gly Ser Gly Gly Ile Thr Tyr Tyr Ala Asp Ser Val
50 55 60

Lys Gly Arg Phe Thr Ile Ser Arg Asp Asn Ser Lys Asn Thr Leu Tyr
65 70 75 80

Leu Gln Met Asn Ser Leu Arg Ala Glu Asp Thr Ala Val Tyr Tyr Cys
85 90 95

Ala Lys Asp Leu Gly Tyr Gly Asp Phe Tyr Tyr Tyr Tyr Tyr Gly Met
100 105 110

Asp Val Trp Gly Gln Gly Thr Thr Val Thr Val Ser Ser
115 120 125

<210> 17
<211> 113
<212> PRT
<213> Artificial Sequence

<220>
<223> immunoglobulin heavy chain variable region

<400> 17

Pro Gly Leu Val Lys Pro Ser Glu Thr Leu Ser Leu Thr Cys Thr Val
1 5 10 15

Ser Gly Gly Ser Ile Ser Ser Tyr Tyr Trp Ser Trp Ile Arg Gln Pro
20 25 30

Pro Gly Lys Gly Leu Glu Trp Ile Gly Tyr Ile Tyr Tyr Ser Gly Ser
35 40 45

Thr Asn Tyr Asn Pro Ser Leu Lys Ser Arg Val Thr Ile Ser Val Asp
50 55 60

Thr Ser Lys Asn Gln Phe Ser Leu Lys Leu Ser Ser Val Thr Ala Ala
65 70 75 80

Asp Thr Ala Val Tyr Tyr Cys Ala Arg Thr Tyr Ser Ser Ser Phe Tyr
85 90 95

Tyr Tyr Gly Met Asp Val Trp Gly Gln Gly Thr Thr Val Thr Val Ser
100 105 110

Ser

<210> 18
<211> 122
<212> PRT
<213> Artificial Sequence

<220>
<223> immunoglobulin heavy chain variable region

<400> 18

Glu Val Gln Leu Leu Glu Ser Gly Gly Gly Leu Val Gln Pro Gly Gly
1 5 10 15

Ser Leu Arg Leu Ser Cys Ala Ala Ser Gly Phe Thr Phe Ser Ser Tyr
20 25 30

Ala Met Ser Trp Val Arg Gln Ala Pro Gly Lys Gly Leu Glu Trp Val
35 40 45

Ser Gly Ile Thr Gly Ser Gly Gly Ser Thr Tyr Tyr Ala Asp Ser Val
50 55 60

Lys Gly Arg Phe Thr Ile Ser Arg Asp Asn Ser Lys Asn Thr Leu Tyr
65 70 75 80

Leu Gln Met Asn Ser Leu Arg Ala Glu Asp Thr Ala Val Tyr Tyr Cys
85 90 95

Ala Lys Asp Pro Gly Thr Thr Val Ile Met Ser Trp Phe Asp Pro Trp
100 105 110

Gly Gln Gly Thr Leu Val Thr Val Ser Ser
115 120

<210> 19
<211> 136
<212> PRT
<213> Artificial Sequence

<220>
<223> immunoglobulin light chain variable region

<400> 19

Ala Ser Val Gly Asp Arg Val Thr Phe Thr Cys Arg Ala Ser Gln Asp
1 5 10 15

Ile Arg Arg Asp Leu Gly Trp Tyr Gln Gln Lys Pro Gly Lys Ala Pro
20 25 30

Lys Arg Leu Ile Tyr Ala Ala Ser Arg Leu Gln Ser Gly Val Pro Ser
35 40 45

Arg Phe Ser Gly Ser Gly Ser Gly Thr Glu Phe Thr Leu Thr Ile Ser
50 55 60

Ser Leu Gln Pro Glu Asp Phe Ala Thr Tyr Tyr Cys Leu Gln His Asn
65 70 75 80

Asn Tyr Pro Arg Thr Phe Gly Gln Gly Thr Glu Val Glu Ile Ile Arg
85 90 95

Thr Val Ala Ala Pro Ser Val Phe Ile Phe Pro Pro Ser Asp Glu Gln
100 105 110

Leu Lys Ser Gly Thr Ala Ser Val Val Cys Leu Leu Asn Asn Phe Tyr
115 120 125

Pro Arg Glu Ala Lys Val Gln Trp
130 135

<210> 20
<211> 107
<212> PRT
<213> Artificial Sequence

<220>
<223> immunoglobulin light chain variable region

<400> 20

Asp Ile Gln Met Thr Gln Phe Pro Ser Ser Leu Ser Ala Ser Val Gly
1 5 10 15

Asp Arg Val Thr Ile Thr Cys Arg Ala Ser Gln Gly Ile Arg Asn Asp
20 25 30

Leu Gly Trp Tyr Gln Gln Lys Pro Gly Lys Ala Pro Lys Arg Leu Ile
35 40 45

Tyr Ala Ala Ser Arg Leu His Arg Gly Val Pro Ser Arg Phe Ser Gly
50 55 60

Ser Gly Ser Gly Thr Glu Phe Thr Leu Thr Ile Ser Ser Leu Gln Pro
65 70 75 80

Glu Asp Phe Ala Thr Tyr Tyr Cys Leu Gln His Asn Ser Tyr Pro Cys
85 90 95

Ser Phe Gly Gln Gly Thr Lys Leu Glu Ile Lys
100 105

<210> 21
<211> 100
<212> PRT
<213> Artificial Sequence

<220>
<223> immunoglobulin light chain variable region

<400> 21

Ser Ser Leu Ser Ala Ser Val Gly Asp Arg Val Thr Phe Thr Cys Arg
1 5 10 15

Ala Ser Gln Asp Ile Arg Arg Asp Leu Gly Trp Tyr Gln Gln Lys Pro
20 25 30

Gly Lys Ala Pro Lys Arg Leu Ile Tyr Ala Ala Ser Arg Leu Gln Ser
35 40 45

Gly Val Pro Ser Arg Phe Ser Gly Ser Gly Ser Gly Thr Glu Phe Thr
50 55 60

Leu Thr Ile Ser Ser Leu Gln Pro Glu Asp Phe Ala Thr Tyr Tyr Cys
65 70 75 80

Leu Gln His Asn Asn Tyr Pro Arg Thr Phe Gly Gln Gly Thr Glu Val
85 90 95

Glu Ile Ile Arg
100

<210> 22
<211> 107
<212> PRT
<213> Artificial Sequence

<220>
<223> immunoglobulin light chain variable region

<400> 22

Asp Ile Gln Met Thr Gln Ser Pro Ser Ser Leu Ser Ala Ser Val Gly
1 5 10 15

Asp Arg Val Thr Ile Thr Cys Arg Ala Ser Gln Gly Ile Arg Ser Asp
20 25 30

Leu Gly Trp Phe Gln Gln Lys Pro Gly Lys Ala Pro Lys Arg Leu Ile
35 40 45

Tyr Ala Ala Ser Lys Leu His Arg Gly Val Pro Ser Arg Phe Ser Gly
50 55 60

Ser Gly Ser Gly Thr Glu Phe Thr Leu Thr Ile Ser Arg Leu Gln Pro
65 70 75 80

Glu Asp Phe Ala Thr Tyr Tyr Cys Leu Gln His Asn Ser Tyr Pro Leu
85 90 95

Thr Phe Gly Gly Gly Thr Lys Val Glu Ile Lys
100 105

<210> 23
<211> 92
<212> PRT

<213> Artificial Sequence

<220>
<223> immunoglobulin light chain variable region

<400> 23

Gly Asp Arg Val Thr Ile Thr Cys Arg Ala Ser Gln Ser Ile Ser Thr
1 5 10 15

Phe Leu Asn Trp Tyr Gln Gln Lys Pro Gly Lys Ala Pro Lys Leu Leu
20 25 30

Ile His Val Ala Ser Ser Leu Gln Gly Gly Val Pro Ser Arg Phe Ser
35 40 45

Gly Ser Gly Ser Gly Thr Asp Phe Thr Leu Thr Ile Ser Ser Leu Gln
50 55 60

Pro Glu Asp Phe Ala Thr Tyr Tyr Cys Gln Gln Ser Tyr Asn Ala Pro
65 70 75 80

Leu Thr Phe Gly Gly Gly Thr Lys Val Glu Ile Lys
85 90

<210> 24
<211> 91
<212> PRT
<213> Artificial Sequence

<220>
<223> immunoglobulin light chain variable region

<400> 24

Arg Ala Thr Leu Ser Cys Arg Ala Ser Gln Ser Val Arg Gly Arg Tyr
1 5 10 15

Leu Ala Trp Tyr Gln Gln Lys Pro Gly Gln Ala Pro Arg Leu Leu Ile
20 25 30

Tyr Gly Ala Ser Ser Arg Ala Thr Gly Ile Pro Asp Arg Phe Ser Gly
35 40 45

Ser Gly Ser Gly Thr Asp Phe Thr Leu Thr Ile Ser Arg Leu Glu Pro
50 55 60

Glu Asp Phe Ala Val Phe Tyr Cys Gln Gln Tyr Gly Ser Ser Pro Arg
65 70 75 80

Thr Phe Gly Gln Gly Thr Lys Val Glu Ile Lys
85 90

<210> 25
<211> 236
<212> PRT
<213> Artificial Sequence

<220>
<223> light chain immunoglobulin

<400> 25

Met Asp Met Arg Val Pro Ala Gln Leu Leu Gly Leu Leu Leu Leu Trp
1 5 10 15

Phe Pro Gly Ala Arg Cys Asp Ile Gln Met Thr Gln Ser Pro Ser Ser
20 25 30

Leu Ser Ala Ser Val Gly Asp Arg Val Thr Ile Thr Cys Arg Ala Ser
35 40 45

Gln Gly Ile Arg Asn Asp Leu Gly Trp Tyr Gln Gln Lys Pro Gly Lys
50 55 60

Ala Pro Lys Arg Leu Ile Tyr Ala Ala Ser Ser Leu Gln Ser Gly Val
65 70 75 80

Pro Ser Arg Phe Ser Gly Ser Gly Ser Gly Thr Glu Phe Thr Leu Thr
85 90 95

Ile Ser Ser Leu Gln Pro Glu Asp Phe Ala Thr Tyr Tyr Cys Leu Gln
100 105 110

His Asn Ser Tyr Pro Trp Thr Phe Gly Gln Gly Thr Lys Val Glu Ile
115 120 125

Lys Arg Thr Val Ala Ala Pro Ser Val Phe Ile Phe Pro Pro Ser Asp
130 135 140

Glu Gln Leu Lys Ser Gly Thr Ala Ser Val Val Cys Leu Leu Asn Asn
145 150 155 160

Phe Tyr Pro Arg Glu Ala Lys Val Gln Trp Lys Val Asp Asn Ala Leu
165 170 175

Gln Ser Gly Asn Ser Gln Glu Ser Val Thr Glu Gln Asp Ser Lys Asp
180 185 190

Ser Thr Tyr Ser Leu Ser Ser Thr Leu Thr Leu Ser Lys Ala Asp Tyr
195 200 205

Glu Lys His Lys Val Tyr Ala Cys Glu Val Thr His Gln Gly Leu Ser
210 215 220

Ser Pro Val Thr Lys Ser Phe Asn Arg Gly Glu Cys
225 230 235

<210> 26
<211> 236
<212> PRT
<213> Artificial Sequence

<220>
<223> light chain immunoglobulin

<400> 26

Met Asp Met Arg Val Pro Ala Gln Leu Leu Gly Leu Leu Leu Leu Trp
1 5 10 15

Phe Pro Gly Ala Arg Cys Asp Ile Gln Met Thr Gln Ser Pro Ser Ser
20 25 30

Leu Ser Ala Ser Val Gly Asp Arg Val Thr Phe Thr Cys Arg Ala Ser
35 40 45

Gln Asp Ile Arg Arg Asp Leu Gly Trp Tyr Gln Gln Lys Pro Gly Lys
50 55 60

Ala Pro Lys Arg Leu Ile Tyr Ala Ala Ser Arg Leu Gln Ser Gly Val
65 70 75 80

Pro Ser Arg Phe Ser Gly Ser Gly Ser Gly Thr Glu Phe Thr Leu Thr
85 90 95

Ile Ser Ser Leu Gln Pro Glu Asp Phe Ala Thr Tyr Tyr Cys Leu Gln
100 105 110

His Asn Asn Tyr Pro Arg Thr Phe Gly Gln Gly Thr Glu Val Glu Ile
115 120 125

Ile Arg Thr Val Ala Ala Pro Ser Val Phe Ile Phe Pro Pro Ser Asp
130 135 140

Glu Gln Leu Lys Ser Gly Thr Ala Ser Val Val Cys Leu Leu Asn Asn
145 150 155 160

Phe Tyr Pro Arg Glu Ala Lys Val Gln Trp Lys Val Asp Asn Ala Leu
165 170 175

Gln Ser Gly Asn Ser Gln Glu Ser Val Thr Glu Gln Asp Ser Lys Asp
180 185 190

Ser Thr Tyr Ser Leu Ser Ser Thr Leu Thr Leu Ser Lys Ala Asp Tyr
195 200 205

Glu Lys His Lys Val Tyr Ala Cys Glu Val Thr His Gln Gly Leu Ser
210 215 220

Ser Pro Val Thr Lys Ser Phe Asn Arg Gly Glu Cys
225 230 235

<210> 27
<211> 236
<212> PRT
<213> Artificial Sequence

<220>
<223> light chain immunoglobulin

<400> 27

Met Asp Met Arg Val Pro Ala Gln Leu Leu Gly Leu Leu Leu Leu Trp
1 5 10 15

Phe Pro Gly Ala Arg Cys Asp Ile Gln Met Thr Gln Ser Pro Ser Ser
20 25 30

Leu Ser Ala Ser Val Gly Asp Arg Val Thr Ile Thr Cys Arg Ala Ser
35 40 45

Gln Gly Ile Arg Asn Asp Leu Gly Trp Tyr Gln Gln Lys Pro Gly Lys
50 55 60

Ala Pro Lys Arg Leu Ile Tyr Ala Ala Ser Ser Leu Gln Ser Gly Val
65 70 75 80

Pro Ser Arg Phe Ser Gly Ser Gly Ser Gly Thr Glu Phe Thr Leu Thr
85 90 95

Ile Ser Ser Leu Gln Pro Glu Asp Phe Ala Thr Tyr Tyr Cys Leu Gln
100 105 110

His Asn Ser Tyr Pro Tyr Thr Phe Gly Gln Gly Thr Lys Leu Glu Ile
115 120 125

Lys Arg Thr Val Ala Ala Pro Ser Val Phe Ile Phe Pro Pro Ser Asp
130 135 140

Glu Gln Leu Lys Ser Gly Thr Ala Ser Val Val Cys Leu Leu Asn Asn
145 150 155 160

Phe Tyr Pro Arg Glu Ala Lys Val Gln Trp Lys Val Asp Asn Ala Leu
165 170 175

Gln Ser Gly Asn Ser Gln Glu Ser Val Thr Glu Gln Asp Ser Lys Asp
180 185 190

Ser Thr Tyr Ser Leu Ser Ser Thr Leu Thr Leu Ser Lys Ala Asp Tyr
195 200 205

Glu Lys His Lys Val Tyr Ala Cys Glu Val Thr His Gln Gly Leu Ser
210 215 220

Ser Pro Val Thr Lys Ser Phe Asn Arg Gly Glu Cys
225 230 235

<210> 28
<211> 236
<212> PRT
<213> Artificial Sequence

<220>
<223> light chain immunoglobulin

<400> 28

Met Asp Met Arg Val Pro Ala Gln Leu Leu Gly Leu Leu Leu Leu Trp
1 5 10 15

Phe Pro Gly Ala Arg Cys Asp Ile Gln Met Thr Gln Phe Pro Ser Ser
20 25 30

Leu Ser Ala Ser Val Gly Asp Arg Val Thr Ile Thr Cys Arg Ala Ser
35 40 45

Gln Gly Ile Arg Asn Asp Leu Gly Trp Tyr Gln Gln Lys Pro Gly Lys
50 55 60

Ala Pro Lys Arg Leu Ile Tyr Ala Ala Ser Arg Leu His Arg Gly Val
65 70 75 80

Pro Ser Arg Phe Ser Gly Ser Gly Ser Gly Thr Glu Phe Thr Leu Thr
85 90 95

Ile Ser Ser Leu Gln Pro Glu Asp Phe Ala Thr Tyr Tyr Cys Leu Gln
100 105 110

His Asn Ser Tyr Pro Cys Ser Phe Gly Gln Gly Thr Lys Leu Glu Ile
115 120 125

Lys Arg Thr Val Ala Ala Pro Ser Val Phe Ile Phe Pro Pro Ser Asp
130 135 140

Glu Gln Leu Lys Ser Gly Thr Ala Ser Val Val Cys Leu Leu Asn Asn
145 150 155 160

Phe Tyr Pro Arg Glu Ala Lys Val Gln Trp Lys Val Asp Asn Ala Leu
165 170 175

Gln Ser Gly Asn Ser Gln Glu Ser Val Thr Glu Gln Asp Ser Lys Asp
180 185 190

Ser Thr Tyr Ser Leu Ser Ser Thr Leu Thr Leu Ser Lys Ala Asp Tyr
195 200 205

Glu Lys His Lys Val Tyr Ala Cys Glu Val Thr His Gln Gly Leu Ser
210 215 220

Ser Pro Val Thr Lys Ser Phe Asn Arg Gly Glu Cys
225 230 235

<210> 29
<211> 473
<212> PRT

<213> Artificial Sequence

<220>
<223> heavy chain immunoglobulin

<400> 29

Met Glu Phe Gly Leu Ser Trp Val Phe Leu Val Ala Ile Ile Lys Gly
1 5 10 15

Val Gln Cys Gln Val Gln Leu Val Glu Ser Gly Gly Gly Leu Val Lys
20 25 30

Pro Gly Gly Ser Leu Arg Leu Ser Cys Ala Ala Ser Gly Phe Thr Phe
35 40 45

Ser Asp Tyr Tyr Met Ser Trp Ile Arg Gln Ala Pro Gly Lys Gly Leu
50 55 60

Glu Trp Val Ser Tyr Ile Ser Ser Ser Gly Ser Thr Ile Tyr Tyr Ala
65 70 75 80

Asp Ser Val Lys Gly Arg Phe Thr Ile Ser Arg Asp Asn Ala Lys Asn
85 90 95

Ser Leu Tyr Leu Gln Met Asn Ser Leu Arg Ala Glu Asp Thr Ala Val
100 105 110

Tyr Tyr Cys Ala Arg Val Leu Arg Phe Leu Glu Trp Leu Leu Tyr Tyr
115 120 125

Tyr Tyr Tyr Tyr Gly Met Asp Val Trp Gly Gln Gly Thr Thr Val Thr
130 135 140

Val Ser Ser Ala Ser Thr Lys Gly Pro Ser Val Phe Pro Leu Ala Pro
145 150 155 160

Cys Ser Arg Ser Thr Ser Glu Ser Thr Ala Ala Leu Gly Cys Leu Val
165 170 175

Lys Asp Tyr Phe Pro Glu Pro Val Thr Val Ser Trp Asn Ser Gly Ala
180 185 190

Leu Thr Ser Gly Val His Thr Phe Pro Ala Val Leu Gln Ser Ser Gly
195 200 205

```
Leu Tyr Ser Leu Ser Ser Val Val Thr Val Pro Ser Ser Asn Phe Gly
    210                 215                 220

Thr Gln Thr Tyr Thr Cys Asn Val Asp His Lys Pro Ser Asn Thr Lys
225                 230                 235                 240

Val Asp Lys Thr Val Glu Arg Lys Cys Cys Val Glu Cys Pro Pro Cys
                245                 250                 255

Pro Ala Pro Pro Val Ala Gly Pro Ser Val Phe Leu Phe Pro Pro Lys
            260                 265                 270

Pro Lys Asp Thr Leu Met Ile Ser Arg Thr Pro Glu Val Thr Cys Val
        275                 280                 285

Val Val Asp Val Ser His Glu Asp Pro Glu Val Gln Phe Asn Trp Tyr
    290                 295                 300

Val Asp Gly Val Glu Val His Asn Ala Lys Thr Lys Pro Arg Glu Glu
305                 310                 315                 320

Gln Phe Asn Ser Thr Phe Arg Val Val Ser Val Leu Thr Val Val His
                325                 330                 335

Gln Asp Trp Leu Asn Gly Lys Glu Tyr Lys Cys Lys Val Ser Asn Lys
345                 350

Gly Leu Pro Ala Pro Ile Glu Lys Thr Ile Ser Lys Thr Lys Gly Gln
        355                 360                 365

Pro Arg Glu Pro Gln Val Tyr Thr Leu Pro Pro Ser Arg Glu Glu Met
    370                 375                 380

Thr Lys Asn Gln Val Ser Leu Thr Cys Leu Val Lys Gly Phe Tyr Pro
385                 390                 395                 400

Ser Asp Ile Ala Val Glu Trp Glu Ser Asn Gly Gln Pro Glu Asn Asn
                405                 410                 415

Tyr Lys Thr Thr Pro Pro Met Leu Asp Ser Asp Gly Ser Phe Phe Leu
            420                 425                 430
```

Tyr Ser Lys Leu Thr Val Asp Lys Ser Arg Trp Gln Gln Gly Asn Val
435 440 445

Phe Ser Cys Ser Val Met His Glu Ala Leu His Asn His Tyr Thr Gln
450 455 460

Lys Ser Leu Ser Leu Ser Pro Gly Lys
465 470

<210> 30
<211> 470
<212> PRT
<213> Artificial Sequence

<220>
<223> heavy chain immunoglobulin

<400> 30

Met Glu Phe Gly Leu Ser Trp Val Phe Leu Val Ala Ile Ile Lys Gly
1 5 10 15

Val Gln Cys Gln Ala Gln Leu Val Glu Ser Gly Gly Gly Leu Val Lys
20 25 30

Pro Gly Gly Ser Leu Arg Leu Ser Cys Ala Ala Ser Gly Phe Thr Phe
35 40 45

Ser Asp Tyr Tyr Met Ser Trp Ile Arg Gln Ala Pro Gly Lys Gly Leu
50 55 60

Glu Trp Val Ser Tyr Ile Ser Ser Ser Gly Ser Thr Arg Asp Tyr Ala
65 70 75 80

Asp Ser Val Lys Gly Arg Phe Thr Ile Ser Arg Asp Asn Ala Lys Asn
85 90 95

Ser Leu Tyr Leu Gln Met Asn Ser Leu Arg Ala Glu Asp Thr Ala Val
100 105 110

Tyr Tyr Cys Val Arg Asp Gly Val Glu Thr Thr Phe Tyr Tyr Tyr Tyr
115 120 125

Tyr Gly Met Asp Val Trp Gly Gln Gly Thr Thr Val Thr Val Ser Ser
130 135 140

```
Ala Ser Thr Lys Gly Pro Ser Val Phe Pro Leu Ala Pro Cys Ser Arg
145                 150                 155                 160

Ser Thr Ser Glu Ser Thr Ala Ala Leu Gly Cys Leu Val Lys Asp Tyr
                165                 170                 175

Phe Pro Glu Pro Val Thr Val Ser Trp Asn Ser Gly Ala Leu Thr Ser
            180                 185                 190

Gly Val His Thr Phe Pro Ala Val Leu Gln Ser Ser Gly Leu Tyr Ser
        195                 200                 205

Leu Ser Ser Val Val Thr Val Pro Ser Ser Asn Phe Gly Thr Gln Thr
    210                 215                 220

Tyr Thr Cys Asn Val Asp His Lys Pro Ser Asn Thr Lys Val Asp Lys
225                 230                 235                 240

Thr Val Glu Arg Lys Cys Cys Val Glu Cys Pro Pro Cys Pro Ala Pro
                245                 250                 255

Pro Val Ala Gly Pro Ser Val Phe Leu Phe Pro Pro Lys Pro Lys Asp
            260                 265                 270

Thr Leu Met Ile Ser Arg Thr Pro Glu Val Thr Cys Val Val Val Asp

        275                 280                 285

Val Ser His Glu Asp Pro Glu Val Gln Phe Asn Trp Tyr Val Asp Gly
    290                 295                 300

Val Glu Val His Asn Ala Lys Thr Lys Pro Arg Glu Glu Gln Phe Asn
305                 310                 315                 320

Ser Thr Phe Arg Val Val Ser Val Leu Thr Val Val His Gln Asp Trp
                325                 330                 335

Leu Asn Gly Lys Glu Tyr Lys Cys Lys Val Ser Asn Lys Gly Leu Pro
            340                 345                 350

Ala Pro Ile Glu Lys Thr Ile Ser Lys Thr Lys Gly Gln Pro Arg Glu
        355                 360                 365

Pro Gln Val Tyr Thr Leu Pro Pro Ser Arg Glu Glu Met Thr Lys Asn
    370                 375                 380
```

Gln Val Ser Leu Thr Cys Leu Val Lys Gly Phe Tyr Pro Ser Asp Ile
385 390 395 400

Ala Val Glu Trp Glu Ser Asn Gly Gln Pro Glu Asn Asn Tyr Lys Thr
405 410 415

Thr Pro Pro Met Leu Asp Ser Asp Gly Ser Phe Phe Leu Tyr Ser Lys
420 425 430

Leu Thr Val Asp Lys Ser Arg Trp Gln Gln Gly Asn Val Phe Ser Cys
435 440 445

Ser Val Met His Glu Ala Leu His Asn His Tyr Thr Gln Lys Ser Leu
450 455 460

Ser Leu Ser Pro Gly Lys
465 470

<210> 31
<211> 470
<212> PRT
<213> Artificial Sequence

<220>
<223> heavy chain immunoglobulin

<400> 31

Met Glu Phe Gly Leu Ser Trp Leu Phe Leu Val Ala Ile Leu Lys Gly
1 5 10 15

Val Gln Cys Glu Val Gln Leu Leu Glu Ser Gly Gly Gly Leu Val Gln
20 25 30

Pro Gly Gly Ser Leu Arg Leu Ser Cys Ala Ala Ser Gly Phe Thr Phe
35 40 45

Ser Ser Tyr Ala Met Ser Trp Val Arg Gln Ala Pro Gly Lys Gly Leu
50 55 60

Glu Trp Val Ser Ala Ile Ser Gly Ser Gly Gly Ser Thr Tyr Tyr Ala
65 70 75 80

Asp Ser Val Lys Gly Arg Phe Thr Ile Ser Arg Asp Asn Ser Lys Asn
85 90 95

Thr Leu Tyr Leu Gln Met Asn Ser Leu Arg Ala Glu Asp Thr Ala Val
100 105 110

Tyr Tyr Cys Ala Lys Gly Tyr Ser Ser Gly Trp Tyr Tyr Tyr Tyr Tyr
115 120 125

Tyr Gly Met Asp Val Trp Gly Gln Gly Thr Thr Val Thr Val Ser Ser
130 135 140

Ala Ser Thr Lys Gly Pro Ser Val Phe Pro Leu Ala Pro Cys Ser Arg
145 150 155 160

Ser Thr Ser Glu Ser Thr Ala Ala Leu Gly Cys Leu Val Lys Asp Tyr
165 170 175

Phe Pro Glu Pro Val Thr Val Ser Trp Asn Ser Gly Ala Leu Thr Ser 180
185 190

Gly Val His Thr Phe Pro Ala Val Leu Gln Ser Ser Gly Leu Tyr Ser
195 200 205

Leu Ser Ser Val Val Thr Val Pro Ser Ser Asn Phe Gly Thr Gln Thr
210 215 220

Tyr Thr Cys Asn Val Asp His Lys Pro Ser Asn Thr Lys Val Asp Lys
225 230 235 240

Thr Val Glu Arg Lys Cys Cys Val Glu Cys Pro Pro Cys Pro Ala Pro
245 250 255

Pro Val Ala Gly Pro Ser Val Phe Leu Phe Pro Pro Lys Pro Lys Asp
260 265 270

Thr Leu Met Ile Ser Arg Thr Pro Glu Val Thr Cys Val Val Val Asp
275 280 285

Val Ser His Glu Asp Pro Glu Val Gln Phe Asn Trp Tyr Val Asp Gly
290 295 300

Val Glu Val His Asn Ala Lys Thr Lys Pro Arg Glu Glu Gln Phe Asn
305 310 315 320

Ser Thr Phe Arg Val Val Ser Val Leu Thr Val Val His Gln Asp Trp
325 330 335

Leu Asn Gly Lys Glu Tyr Lys Cys Lys Val Ser Asn Lys Gly Leu Pro
340 345 350

Ala Pro Ile Glu Lys Thr Ile Ser Lys Thr Lys Gly Gln Pro Arg Glu
355 360 365

Pro Gln Val Tyr Thr Leu Pro Pro Ser Arg Glu Glu Met Thr Lys Asn
370 375 380

Gln Val Ser Leu Thr Cys Leu Val Lys Gly Phe Tyr Pro Ser Asp Ile
385 390 395 400

Ala Val Glu Trp Glu Ser Asn Gly Gln Pro Glu Asn Asn Tyr Lys Thr
405 410 415

Thr Pro Pro Met Leu Asp Ser Asp Gly Ser Phe Phe Leu Tyr Ser Lys
420 425 430

Leu Thr Val Asp Lys Ser Arg Trp Gln Gln Gly Asn Val Phe Ser Cys
435 440 445

Ser Val Met His Glu Ala Leu His Asn His Tyr Thr Gln Lys Ser Leu
450 455 460

Ser Leu Ser Pro Gly Lys
465 470

<210> 32
<211> 470
<212> PRT
<213> Artificial Sequence

<220>
<223> heavy chain immunoglobulin

<400> 32
Met Glu Phe Gly Leu Ser Trp Leu Phe Leu Val Ala Ile Leu Lys Gly
1 5 10 15

Val Gln Cys Glu Val Gln Leu Leu Glu Ser Gly Gly Gly Leu Val Gln
20 25 30

Pro Gly Gly Ser Leu Arg Leu Ser Cys Thr Ala Ser Gly Phe Thr Phe
35 40 45

```
Ser Ser Tyr Ala Met Asn Trp Val Arg Gln Ala Pro Gly Lys Gly Leu
    50                  55                  60

Glu Trp Val Ser Ala Ile Ser Gly Ser Gly Gly Thr Thr Phe Tyr Ala
65                  70                  75                  80

Asp Ser Val Lys Gly Arg Phe Thr Ile Ser Arg Asp Asn Ser Arg Thr
                85                  90                  95

Thr Leu Tyr Leu Gln Met Asn Ser Leu Arg Ala Glu Asp Thr Ala Val
            100                 105                 110

Tyr Tyr Cys Ala Lys Asp Leu Gly Trp Ser Asp Ser Tyr Tyr Tyr Tyr
        115                 120                 125

Tyr Gly Met Asp Val Trp Gly Gln Gly Thr Thr Val Thr Val Ser Ser
    130                 135                 140

Ala Ser Thr Lys Gly Pro Ser Val Phe Pro Leu Ala Pro Cys Ser Arg
145                 150                 155                 160

Ser Thr Ser Glu Ser Thr Ala Ala Leu Gly Cys Leu Val Lys Asp Tyr
                165                 170                 175

Phe Pro Glu Pro Val Thr Val Ser Trp Asn Ser Gly Ala Leu Thr Ser
            180                 185                 190

Gly Val His Thr Phe Pro Ala Val Leu Gln Ser Ser Gly Leu Tyr Ser
        195                 200                 205

Leu Ser Ser Val Val Thr Val Pro Ser Ser Asn Phe Gly Thr Gln Thr
    210                 215                 220

Tyr Thr Cys Asn Val Asp His Lys Pro Ser Asn Thr Lys Val Asp Lys
225                 230                 235                 240

Thr Val Glu Arg Lys Cys Cys Val Glu Cys Pro Pro Cys Pro Ala Pro
                245                 250                 255

Pro Val Ala Gly Pro Ser Val Phe Leu Phe Pro Pro Lys Pro Lys Asp
            260                 265                 270

Thr Leu Met Ile Ser Arg Thr Pro Glu Val Thr Cys Val Val Val Asp
        275                 280                 285
```

Val Ser His Glu Asp Pro Glu Val Gln Phe Asn Trp Tyr Val Asp Gly
290 295 300

Val Glu Val His Asn Ala Lys Thr Lys Pro Arg Glu Glu Gln Phe Asn
305 310 315 320

Ser Thr Phe Arg Val Val Ser Val Leu Thr Val Val His Gln Asp Trp
325 330 335

Leu Asn Gly Lys Glu Tyr Lys Cys Lys Val Ser Asn Lys Gly Leu Pro
340 345 350

Ala Pro Ile Glu Lys Thr Ile Ser Lys Thr Lys Gly Gln Pro Arg Glu
355 360 365

Pro Gln Val Tyr Thr Leu Pro Pro Ser Arg Glu Glu Met Thr Lys Asn
370 375 380

Gln Val Ser Leu Thr Cys Leu Val Lys Gly Phe Tyr Pro Ser Asp Ile
385 390 395 400

Ala Val Glu Trp Glu Ser Asn Gly Gln Pro Glu Asn Asn Tyr Lys Thr
405 410 415

Thr Pro Pro Met Leu Asp Ser Asp Gly Ser Phe Phe Leu Tyr Ser Lys
420 425 430

Leu Thr Val Asp Lys Ser Arg Trp Gln Gln Gly Asn Val Phe Ser Cys
435 440 445

Ser Val Met His Glu Ala Leu His Asn His Tyr Thr Gln Lys Ser Leu
450 455 460

Ser Leu Ser Pro Gly Lys
465 470

<210> 33
<211> 470
<212> PRT
<213> Artificial Sequence

<220>
<223> immunoglobulin heavy chain of 2.12.1 fx

<400> 33

Met Glu Phe Gly Leu Ser Trp Val Phe Leu Val Ala Ile Ile Lys Gly
1 5 10 15

Val Gln Cys Gln Val Gln Leu Val Glu Ser Gly Gly Gly Leu Val Lys
20 25 30

Pro Gly Gly Ser Leu Arg Leu Ser Cys Ala Ala Ser Gly Phe Thr Phe
35 40 45

Ser Asp Tyr Tyr Met Ser Trp Ile Arg Gln Ala Pro Gly Lys Gly Leu
50 55 60

Glu Trp Val Ser Tyr Ile Ser Ser Ser Gly Ser Thr Arg Asp Tyr Ala
65 70 75 80

Asp Ser Val Lys Gly Arg Phe Thr Ile Ser Arg Asp Asn Ala Lys Asn
85 90 95

Ser Leu Tyr Leu Gln Met Asn Ser Leu Arg Ala Glu Asp Thr Ala Val
100 105 110

Tyr Tyr Cys Ala Arg Asp Gly Val Glu Thr Thr Phe Tyr Tyr Tyr Tyr
115 120 125

Tyr Gly Met Asp Val Trp Gly Gln Gly Thr Thr Val Thr Val Ser Ser
130 135 140

Ala Ser Thr Lys Gly Pro Ser Val Phe Pro Leu Ala Pro Cys Ser Arg
145 150 155 160

Ser Thr Ser Glu Ser Thr Ala Ala Leu Gly Cys Leu Val Lys Asp Tyr
165 170 175

Phe Pro Glu Pro Val Thr Val Ser Trp Asn Ser Gly Ala Leu Thr Ser
180 185 190

Gly Val His Thr Phe Pro Ala Val Leu Gln Ser Ser Gly Leu Tyr Ser
195 200 205

Leu Ser Ser Val Val Thr Val Pro Ser Ser Asn Phe Gly Thr Gln Thr
210 215 220

```
Tyr Thr Cys Asn Val Asp His Lys Pro Ser Asn Thr Lys Val Asp Lys
225                 230                 235                 240

Thr Val Glu Arg Lys Cys Cys Val Glu Cys Pro Pro Cys Pro Ala Pro
                245                 250                 255

Pro Val Ala Gly Pro Ser Val Phe Leu Phe Pro Pro Lys Pro Lys Asp
            260                 265                 270

Thr Leu Met Ile Ser Arg Thr Pro Glu Val Thr Cys Val Val Val Asp
        275                 280                 285

Val Ser His Glu Asp Pro Glu Val Gln Phe Asn Trp Tyr Val Asp Gly
    290                 295                 300

Val Glu Val His Asn Ala Lys Thr Lys Pro Arg Glu Glu Gln Phe Asn
305                 310                 315                 320

Ser Thr Phe Arg Val Val Ser Val Leu Thr Val Val His Gln Asp Trp
                325                 330                 335

Leu Asn Gly Lys Glu Tyr Lys Cys Lys Val Ser Asn Lys Gly Leu Pro
            340                 345                 350

Ala Pro Ile Glu Lys Thr Ile Ser Lys Thr Lys Gly Gln Pro Arg Glu
        355                 360                 365

Pro Gln Val Tyr Thr Leu Pro Pro Ser Arg Glu Glu Met Thr Lys Asn
    370                 375                 380

Gln Val Ser Leu Thr Cys Leu Val Lys Gly Phe Tyr Pro Ser Asp Ile
385                 390                 395                 400

Ala Val Glu Trp Glu Ser Asn Gly Gln Pro Glu Asn Asn Tyr Lys Thr
                405                 410                 415

Thr Pro Pro Met Leu Asp Ser Asp Gly Ser Phe Phe Leu Tyr Ser Lys
            420                 425                 430

Leu Thr Val Asp Lys Ser Arg Trp Gln Gln Gly Asn Val Phe Ser Cys
        435                 440                 445
```

Ser Val Met His Glu Ala Leu His Asn His Tyr Thr Gln Lys Ser Leu
450 455 460

Ser Leu Ser Pro Gly Lys
465 470

<210> 34
<211> 125
<212> PRT
<213> Artificial Sequence

<220>
<223> mature immunoglobulin heavy chain variable region of 2.12.1 fx

<400> 34

Gln Val Gln Leu Val Glu Ser Gly Gly Gly Leu Val Lys Pro Gly Gly
1 5 10 15

Ser Leu Arg Leu Ser Cys Ala Ala Ser Gly Phe Thr Phe Ser Asp Tyr
20 25 30

Tyr Met Ser Trp Ile Arg Gln Ala Pro Gly Lys Gly Leu Glu Trp Val
35 40 45

Ser Tyr Ile Ser Ser Ser Gly Ser Thr Arg Asp Tyr Ala Asp Ser Val
50 55 60

Lys Gly Arg Phe Thr Ile Ser Arg Asp Asn Ala Lys Asn Ser Leu Tyr
65 70 75 80

Leu Gln Met Asn Ser Leu Arg Ala Glu Asp Thr Ala Val Tyr Tyr Cys
85 90 95

Ala Arg Asp Gly Val Glu Thr Thr Phe Tyr Tyr Tyr Tyr Tyr Gly Met
100 105 110

Asp Val Trp Gly Gln Gly Thr Thr Val Thr Val Ser Ser
115 120 125

<210> 35
<211> 236
<212> PRT
<213> Artificial Sequence

<220>
<223> immunoglobulin light chain of 2.12.1 fx

<400> 35

Met Asp Met Arg Val Pro Ala Gln Leu Leu Gly Leu Leu Leu Leu Trp
1 5 10 15

Phe Pro Gly Ala Arg Cys Asp Ile Gln Met Thr Gln Ser Pro Ser Ser
20 25 30

Leu Ser Ala Ser Val Gly Asp Arg Val Thr Ile Thr Cys Arg Ala Ser
35 40 45

Gln Asp Ile Arg Arg Asp Leu Gly Trp Tyr Gln Gln Lys Pro Gly Lys
50 55 60

Ala Pro Lys Arg Leu Ile Tyr Ala Ala Ser Arg Leu Gln Ser Gly Val
65 70 75 80

Pro Ser Arg Phe Ser Gly Ser Gly Ser Gly Thr Glu Phe Thr Leu Thr
85 90 95

Ile Ser Ser Leu Gln Pro Glu Asp Phe Ala Thr Tyr Tyr Cys Leu Gln
100 105 110

His Asn Asn Tyr Pro Arg Thr Phe Gly Gln Gly Thr Lys Val Glu Ile
115 120 125

Lys Arg Thr Val Ala Ala Pro Ser Val Phe Ile Phe Pro Pro Ser Asp
130 135 140

Glu Gln Leu Lys Ser Gly Thr Ala Ser Val Val Cys Leu Leu Asn Asn
145 150 155 160

Phe Tyr Pro Arg Glu Ala Lys Val Gln Trp Lys Val Asp Asn Ala Leu
165 170 175

Gln Ser Gly Asn Ser Gln Glu Ser Val Thr Glu Gln Asp Ser Lys Asp
180 185 190

Ser Thr Tyr Ser Leu Ser Ser Thr Leu Thr Leu Ser Lys Ala Asp Tyr
195 200 205

Glu Lys His Lys Val Tyr Ala Cys Glu Val Thr His Gln Gly Leu Ser
210 215 220

Ser Pro Val Thr Lys Ser Phe Asn Arg Gly Glu Cys
225 230 235

<210> 36
<211> 108
<212> PRT
<213> Artificial Sequence

<220>
<223> mature immunoglobulin light chain variable region of 2.12.1 fx

<400> 36

Asp Ile Gln Met Thr Gln Ser Pro Ser Ser Leu Ser Ala Ser Val Gly
1 5 10 15

Asp Arg Val Thr Ile Thr Cys Arg Ala Ser Gln Asp Ile Arg Arg Asp
20 25 30

Leu Gly Trp Tyr Gln Gln Lys Pro Gly Lys Ala Pro Lys Arg Leu Ile
35 40 45

Tyr Ala Ala Ser Arg Leu Gln Ser Gly Val Pro Ser Arg Phe Ser Gly
50 55 60

Ser Gly Ser Gly Thr Glu Phe Thr Leu Thr Ile Ser Ser Leu Gln Pro
65 70 75 80

Glu Asp Phe Ala Thr Tyr Tyr Cys Leu Gln His Asn Asn Tyr Pro Arg
85 90 95

Thr Phe Gly Gln Gly Thr Lys Val Glu Ile Lys Arg
100 105

<210> 37
<211> 112
<212> PRT
<213> Artificial Sequence

<220>
<223> humanized 7C10 immunoglobulin light chain variable region; version 1

<400> 37

Asp Val Val Met Thr Gln Ser Pro Leu Ser Leu Pro Val Thr Pro Gly
1 5 10 15

Glu Pro Ala Ser Ile Ser Cys Arg Ser Ser Gln Ser Ile Val His Ser
20 25 30

Asn Gly Asn Thr Tyr Leu Gln Trp Tyr Leu Gln Lys Pro Gly Gln Ser
35 40 45

Pro Gln Leu Leu Ile Tyr Lys Val Ser Asn Arg Leu Tyr Gly Val Pro
50 55 60

Asp Arg Phe Ser Gly Ser Gly Ser Gly Thr Asp Phe Thr Leu Lys Ile
65 70 75 80

Ser Arg Val Glu Ala Glu Asp Val Gly Val Tyr Tyr Cys Phe Gln Gly
85 90 95

Ser His Val Pro Trp Thr Phe Gly Gln Gly Thr Lys Val Glu Ile Lys
100 105 110

<210> 38
<211> 112
<212> PRT
<213> Artificial Sequence

<220>
<223> humanized 7C10 immunoglobulin light chain variable region; version 2

<400> 38

Asp Ile Val Met Thr Gln Ser Pro Leu Ser Leu Pro Val Thr Pro Gly
1 5 10 15

Glu Pro Ala Ser Ile Ser Cys Arg Ser Ser Gln Ser Ile Val His Ser
20 25 30

Asn Gly Asn Thr Tyr Leu Gln Trp Tyr Leu Gln Lys Pro Gly Gln Ser
35 40 45

Pro Gln Leu Leu Ile Tyr Lys Val Ser Asn Arg Leu Tyr Gly Val Pro
50 55 60

Asp Arg Phe Ser Gly Ser Gly Ser Gly Thr Asp Phe Thr Leu Lys Ile
65 70 75 80

Ser Arg Val Glu Ala Glu Asp Val Gly Val Tyr Tyr Cys Phe Gln Gly
85 90 95

Ser His Val Pro Trp Thr Phe Gly Gln Gly Thr Lys Val Glu Ile Lys
100 105 110

<210> 39
<211> 117
<212> PRT
<213> Artificial Sequence

<220>
<223> humanized 7C10 immunoglobulin heavy chain variable region; version 1

<400> 39

Gln Val Gln Leu Gln Glu Ser Gly Pro Gly Leu Val Lys Pro Ser Glu
1 5 10 15

Thr Leu Ser Leu Thr Cys Thr Val Ser Gly Tyr Ser Ile Thr Gly Gly
20 25 30

Tyr Leu Trp Asn Trp Ile Arg Gln Pro Pro Gly Lys Gly Leu Glu Trp
35 40 45

Met Gly Tyr Ile Ser Tyr Asp Gly Thr Asn Asn Tyr Lys Pro Ser Leu
50 55 60

Lys Asp Arg Ile Thr Ile Ser Arg Asp Thr Ser Lys Asn Gln Phe Ser
65 70 75 80

Leu Lys Leu Ser Ser Val Thr Ala Ala Asp Thr Ala Val Tyr Tyr Cys
85 90 95

Ala Arg Tyr Gly Arg Val Phe Phe Asp Tyr Trp Gly Gln Gly Thr Leu
100 105 110

Val Thr Val Ser Ser
115

<210> 40
<211> 117
<212> PRT
<213> Artificial Sequence

<220>
<223> humanized 7C10 immunoglobulin heavy chain variable region; version 2

<400> 40

Gln Val Gln Leu Gln Glu Ser Gly Pro Gly Leu Val Lys Pro Ser Glu
1 5 10 15

Thr Leu Ser Leu Thr Cys Thr Val Ser Gly Tyr Ser Ile Thr Gly Gly
20 25 30

Tyr Leu Trp Asn Trp Ile Arg Gln Pro Pro Gly Lys Gly Leu Glu Trp
35 40 45

Ile Gly Tyr Ile Ser Tyr Asp Gly Thr Asn Asn Tyr Lys Pro Ser Leu
50 55 60

Lys Asp Arg Val Thr Ile Ser Arg Asp Thr Ser Lys Asn Gln Phe Ser
65 70 75 80

Leu Lys Leu Ser Ser Val Thr Ala Ala Asp Thr Ala Val Tyr Tyr Cys
85 90 95

Ala Arg Tyr Gly Arg Val Phe Phe Asp Tyr Trp Gly Gln Gly Thr Leu
100 105 110

Val Thr Val Ser Ser
115

<210> 41
<211> 117
<212> PRT
<213> Artificial Sequence

<220>
<223> humanized 7C10 immunoglobulin heavy chain variable region; version 3

<400> 41

Gln Val Gln Leu Gln Glu Ser Gly Pro Gly Leu Val Lys Pro Ser Glu
1 5 10 15

Thr Leu Ser Leu Thr Cys Thr Val Ser Gly Tyr Ser Ile Ser Gly Gly
20 25 30

Tyr Leu Trp Asn Trp Ile Arg Gln Pro Pro Gly Lys Gly Leu Glu Trp
35 40 45

Ile Gly Tyr Ile Ser Tyr Asp Gly Thr Asn Asn Tyr Lys Pro Ser Leu
50 55 60

Lys Asp Arg Val Thr Ile Ser Val Asp Thr Ser Lys Asn Gln Phe Ser
65 70 75 80

Leu Lys Leu Ser Ser Val Thr Ala Ala Asp Thr Ala Val Tyr Tyr Cys
85 90 95

Ala Arg Tyr Gly Arg Val Phe Phe Asp Tyr Trp Gly Gln Gly Thr Leu
100 105 110

Val Thr Val Ser Ser
115

<210> 42
<211> 130
<212> PRT
<213> Artificial Sequence

<220>
<223> A12 immunoglobulin heavy chain variable region

<400> 42

Glu Val Gln Leu Val Gln Ser Gly Ala Glu Val Lys Lys Pro Gly Ser
1 5 10 15

Ser Val Lys Val Ser Cys Lys Ala Ser Gly Gly Thr Phe Ser Ser Tyr
20 25 30

Ala Ile Ser Trp Val Arg Gln Ala Pro Gly Gln Gly Leu Glu Trp Met
35 40 45

Gly Gly Ile Ile Pro Ile Phe Gly Thr Ala Asn Tyr Ala Gln Lys Phe
50 55 60

Gln Gly Arg Val Thr Ile Thr Ala Asp Lys Ser Thr Ser Thr Ala Tyr
65 70 75 80

Met Glu Leu Ser Ser Leu Arg Ser Glu Asp Thr Ala Val Tyr Tyr Cys
85 90 95

Ala Arg Ala Pro Leu Arg Phe Leu Glu Trp Ser Thr Gln Asp His Tyr
100 105 110

Tyr Tyr Tyr Tyr Met Asp Val Trp Gly Lys Gly Thr Thr Val Thr Val
115 120 125

Ser Ser
130

<210> 43
<211> 109
<212> PRT
<213> Artificial Sequence

<220>
<223> A12 immunoglobulin light chain variable region

<400> 43

Ser Ser Glu Leu Thr Gln Asp Pro Ala Val Ser Val Ala Leu Gly Gln
1 5 10 15

Thr Val Arg Ile Thr Cys Gln Gly Asp Ser Leu Arg Ser Tyr Tyr Ala
20 25 30

Ser Trp Tyr Gln Gln Lys Pro Gly Gln Ala Pro Val Leu Val Ile Tyr
35 40 45

Gly Lys Asn Asn Arg Pro Ser Gly Ile Pro Asp Arg Phe Ser Gly Ser
50 55 60

Ser Ser Gly Asn Thr Ala Ser Leu Thr Ile Thr Gly Ala Gln Ala Glu
65 70 75 80

Asp Glu Ala Asp Tyr Tyr Cys Asn Ser Arg Asp Asn Ser Asp Asn Arg
85 90 95

Leu Ile Phe Gly Gly Gly Thr Lys Leu Thr Val Leu Ser
100 105

<210> 44
<211> 119
<212> PRT
<213> Artificial Sequence

<220>
<223> 1A immunoglobulin heavy chain variable region

<220>
<221> MISC_FEATURE
<222> (1)..(119)
<223> Possible mutations: R30, S30, N31, S31, Y94, H94, D104, E104.

<400> 44

Glu Val Gln Leu Val Gln Ser Gly Gly Gly Leu Val His Pro Gly Gly
1 5 10 15

Ser Leu Arg Leu Ser Cys Ala Gly Ser Gly Phe Thr Phe Arg Asn Tyr
20 25 30

Ala Met Tyr Trp Val Arg Gln Ala Pro Gly Lys Gly Leu Glu Trp Val
35 40 45

Ser Ala Ile Gly Ser Gly Gly Gly Thr Tyr Tyr Ala Asp Ser Val Lys
50 55 60

Gly Arg Phe Thr Ile Ser Arg Asp Asn Ala Lys Asn Ser Leu Tyr Leu
65 70 75 80

Gln Met Asn Ser Leu Arg Ala Glu Asp Met Ala Val Tyr Tyr Cys Ala
85 90 95

Arg Ala Pro Asn Trp Gly Ser Asp Ala Phe Asp Ile Trp Gly Gln Gly
100 105 110

Thr Met Val Thr Val Ser Ser
115

<210> 45
<211> 107
<212> PRT
<213> Artificial Sequence

<220>
<223> 1A immunoglobulin light chain variable region

<220>
<221> MISC_FEATURE
<222> (1)..(107)
<223> possible mutations: P96, I96, P100, Q100, R103, K103, V104, L104, D105, E105

<400> 45

Asp Ile Gln Met Thr Gln Ser Pro Ser Ser Leu Ser Ala Ser Val Gly
1 5 10 15

Asp Arg Val Thr Ile Thr Cys Arg Ala Ser Gln Gly Ile Ser Ser Trp
20 25 30

Leu Ala Trp Tyr Gln Gln Lys Pro Glu Lys Ala Pro Lys Ser Leu Ile
35 40 45

Tyr Ala Ala Ser Ser Leu Gln Ser Gly Val Pro Ser Arg Phe Ser Gly
50 55 60

Ser Gly Ser Gly Thr Asp Phe Thr Leu Thr Ile Ser Ser Leu Gln Pro
65 70 75 80

Glu Asp Phe Ala Thr Tyr Tyr Cys Gln Gln Tyr Asn Ser Tyr Pro Pro
85 90 95

Thr Phe Gly Pro Gly Thr Lys Val Asp Ile Lys
100 105

<210> 46
<211> 251
<212> PRT
<213> Artificial Sequence

<220>
<223> single chain fv 8A1

<400> 46

Glu Val Gln Leu Val Gln Ser Gly Ala Glu Val Lys Lys Pro Gly Glu
1 5 10 15

Ser Leu Thr Ile Ser Cys Lys Gly Pro Gly Tyr Asn Phe Phe Asn Tyr
20 25 30

Trp Ile Gly Trp Val Arg Gln Met Pro Gly Lys Gly Leu Glu Trp Met
35 40 45

Gly Ile Ile Tyr Pro Thr Asp Ser Asp Thr Arg Tyr Ser Pro Ser Phe
50 55 60

Gln Gly Gln Val Thr Ile Ser Val Asp Lys Ser Ile Ser Thr Ala Tyr
65 70 75 80

Leu Gln Trp Ser Ser Leu Lys Ala Ser Asp Thr Ala Met Tyr Tyr Cys
85 90 95

Ala Arg Ser Ile Arg Tyr Cys Pro Gly Gly Arg Cys Tyr Ser Gly Tyr
100 105 110

Tyr Gly Met Asp Val Trp Gly Gln Gly Thr Met Val Thr Val Ser Ser
115 120 125

Gly Gly Gly Gly Ser Gly Gly Gly Gly Ser Gly Gly Gly Gly Ser Ser
130 135 140

Glu Leu Thr Gln Asp Pro Ala Val Ser Val Ala Leu Gly Gln Thr Val
145 150 155 160

Arg Ile Thr Cys Gln Gly Asp Ser Leu Arg Ser Tyr Tyr Ala Ser Trp
165 170 175

Tyr Gln Gln Lys Pro Gly Gln Ala Pro Val Leu Val Ile Tyr Gly Lys
180 185 190

Asn Asn Arg Pro Ser Gly Ile Pro Asp Arg Phe Ser Gly Ser Ser Ser
195 200 205

Gly Asn Thr Ala Ser Leu Thr Ile Thr Gly Ala Gln Ala Glu Asp Glu
210 215 220

Ala Asp Tyr Tyr Cys Asn Ser Arg Asp Ser Ser Gly Asn His Val Val
225 230 235 240

Phe Gly Gly Gly Thr Lys Leu Thr Val Leu Gly
245 250

<210> 47
<211> 245
<212> PRT
<213> Artificial Sequence

<220>
<223> single chain fv 9A2

<400> 47

Gln Val Gln Leu Val Gln Ser Gly Ala Glu Val Arg Lys Pro Gly Ala
1 5 10 15

Ser Val Lys Val Ser Cys Lys Thr Ser Gly Tyr Thr Phe Arg Asn Tyr
20 25 30

Asp Ile Asn Trp Val Arg Gln Ala Pro Gly Gln Gly Leu Glu Trp Met
35 40 45

```
Gly Arg Ile Ser Gly His Tyr Gly Asn Thr Asp His Ala Gln Lys Phe
    50                  55                  60

Gln Gly Arg Phe Thr Met Thr Lys Asp Thr Ser Thr Ser Thr Ala Tyr
65                  70                  75                  80

Met Glu Leu Arg Ser Leu Thr Phe Asp Asp Thr Ala Val Tyr Tyr Cys
                85                  90                  95

Ala Arg Ser Gln Trp Asn Val Asp Tyr Trp Gly Arg Gly Thr Leu Val
            100                 105                 110

Thr Val Ser Ser Gly Gly Gly Gly Ser Gly Gly Gly Gly Ser Gly Gly
        115                 120                 125

Gly Gly Ser Ala Leu Asn Phe Met Leu Thr Gln Pro His Ser Val Ser
    130                 135                 140

Glu Ser Pro Gly Lys Thr Val Thr Ile Ser Cys Thr Arg Ser Ser Gly
145                 150                 155                 160

Ser Ile Ala Ser Asn Tyr Val Gln Trp Tyr Gln Gln Arg Pro Gly Ser
                165                 170                 175

Ser Pro Thr Thr Val Ile Phe Glu Asp Asn Arg Arg Pro Ser Gly Val
            180                 185                 190

Pro Asp Arg Phe Ser Gly Ser Ile Asp Thr Ser Ser Asn Ser Ala Ser
        195                 200                 205

Leu Thr Ile Ser Gly Leu Lys Thr Glu Asp Glu Ala Asp Tyr Tyr Cys
    210                 215                 220

Gln Ser Phe Asp Ser Thr Asn Leu Val Val Phe Gly Gly Gly Thr Lys
225                 230                 235                 240

Val Thr Val Leu Gly
                245
```

<210> 48
<211> 245
<212> PRT
<213> Artificial Sequence

<220>
<223> single chain fv 11A4

<400> 48

Glu Val Gln Leu Leu Glu Ser Gly Gly Gly Leu Val Gln Pro Gly Gly
1 5 10 15

Ser Leu Arg Leu Ser Cys Ala Ala Ser Gly Phe Thr Phe Ser Ser Tyr
20 25 30

Ala Met Ser Trp Val Arg Gln Ala Pro Gly Lys Gly Leu Glu Trp Val
35 40 45

Ser Ala Ile Ser Gly Ser Gly Gly Ser Thr Tyr Tyr Ala Asp Ser Val
50 55 60

Lys Gly Arg Phe Thr Ile Ser Arg Asp Asn Ser Lys Asn Thr Leu Tyr
65 70 75 80

Leu Gln Met Asn Ser Leu Arg Ala Glu Asp Thr Ala Val Tyr Tyr Cys
85 90 95

Ala Ser Ser Pro Tyr Ser Ser Arg Trp Tyr Ser Phe Asp Pro Trp Gly
100 105 110

Gln Gly Thr Met Val Thr Val Ser Ser Gly Gly Gly Gly Ser Gly Gly
115 120 125

Gly Gly Ser Gly Gly Gly Gly Ser Ala Leu Ser Tyr Glu Leu Thr Gln
130 135 140

Pro Pro Ser Val Ser Val Ser Pro Gly Gln Thr Ala Thr Ile Thr Cys
145 150 155 160

Ser Gly Asp Asp Leu Gly Asn Lys Tyr Val Ser Trp Tyr Gln Gln Lys
165 170 175

Pro Gly Gln Ser Pro Val Leu Val Ile Tyr Gln Asp Thr Lys Arg Pro
180 185 190

Ser Gly Ile Pro Glu Arg Phe Ser Gly Ser Asn Ser Gly Asn Ile Ala
195 200 205

Thr Leu Thr Ile Ser Gly Thr Gln Ala Val Asp Glu Ala Asp Tyr Tyr
210 215 220

Cys Gln Val Trp Asp Thr Gly Thr Val Val Phe Gly Gly Gly Thr Lys
225 230 235 240

Leu Thr Val Leu Gly
245

<210> 49
<211> 251
<212> PRT
<213> Artificial Sequence

<220>
<223> single chain fv 7A4

<400> 49

Glu Val Gln Leu Val Gln Ser Gly Ala Glu Val Lys Lys Pro Gly Glu
1 5 10 15

Ser Leu Thr Ile Ser Cys Lys Gly Ser Gly Tyr Asn Phe Phe Asn Tyr
20 25 30

Trp Ile Gly Trp Val Arg Gln Met Pro Gly Lys Asp Leu Glu Trp Met
35 40 45

Gly Ile Ile Tyr Pro Thr Asp Ser Asp Thr Arg Tyr Ser Pro Ser Phe
50 55 60

Gln Gly Gln Val Thr Ile Ser Val Asp Lys Ser Ile Ser Thr Ala Tyr
65 70 75 80

Leu Gln Trp Ser Ser Leu Lys Ala Ser Asp Thr Ala Met Tyr Tyr Cys
85 90 95

Ala Arg Ser Ile Arg Tyr Cys Pro Gly Gly Arg Cys Tyr Ser Gly Tyr
100 105 110

Tyr Gly Met Asp Val Trp Gly Gln Gly Thr Met Val Thr Val Ser Ser
115 120 125

Gly Gly Gly Ser Ser Gly Gly Gly Gly Ser Gly Gly Gly Gly Ser Ser
130 135 140

```
Glu Leu Thr Gln Asp Pro Ala Val Ser Val Ala Leu Gly Gln Thr Val
145                 150                 155                 160

Arg Ile Thr Cys Arg Gly Asp Ser Leu Arg Asn Tyr Tyr Ala Ser Trp
                165                 170                 175

Tyr Gln Gln Lys Pro Gly Gln Ala Pro Val Leu Val Ile Tyr Gly Lys
            180                 185                 190

Asn Asn Arg Pro Ser Gly Ile Pro Asp Arg Phe Ser Gly Ser Ser Ser
        195                 200                 205

Gly Asn Thr Ala Ser Leu Thr Ile Thr Gly Ala Gln Ala Glu Asp Glu
    210                 215                 220

Ala Asp Tyr Tyr Cys Asn Ser Arg Asp Ser Ser Gly Asn His Met Val
225                 230                 235                 240

Phe Gly Gly Gly Thr Lys Leu Thr Val Leu Gly
                245                 250
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<210> 50
<211> 249
<212> PRT
<213> Artificial Sequence

<220>
<223> single chain fv 11A1

<400> 50

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Glu Val Gln Leu Val Glu Ser Gly Gly Gly Val Val Gln Pro Gly Arg
1               5                   10                  15

Ser Leu Arg Leu Ser Cys Ala Ala Ser Gly Phe Thr Phe Ser Asp Phe
            20                  25                  30

Ala Met His Trp Val Arg Gln Ile Pro Gly Lys Gly Leu Glu Trp Leu
        35                  40                  45

Ser Gly Leu Arg His Asp Gly Ser Thr Ala Tyr Tyr Ala Gly Ser Val
    50                  55                  60

Lys Gly Arg Phe Thr Ile Ser Arg Asp Asn Ser Arg Asn Thr Val Tyr
65                  70                  75                  80
```

Leu Gln Met Asn Ser Leu Arg Ala Glu Asp Thr Ala Thr Tyr Tyr Cys
85 90 95

Val Thr Gly Ser Gly Ser Ser Gly Pro His Ala Phe Pro Val Trp Gly
100 105 110

Lys Gly Thr Leu Val Thr Val Ser Ser Gly Gly Gly Gly Ser Gly Gly
115 120 125

Gly Gly Ser Gly Gly Gly Gly Ser Ala Leu Ser Tyr Val Leu Thr Gln
130 135 140

Pro Pro Ser Ala Ser Gly Thr Pro Gly Gln Arg Val Thr Ile Ser Cys
145 150 155 160

Ser Gly Ser Asn Ser Asn Ile Gly Thr Tyr Thr Val Asn Trp Phe Gln
165 170 175

Gln Leu Pro Gly Thr Ala Pro Lys Leu Leu Ile Tyr Ser Asn Asn Gln
180 185 190

Arg Pro Ser Gly Val Pro Asp Arg Phe Ser Gly Ser Lys Ser Gly Thr
195 200 205

Ser Ala Ser Leu Ala Ile Ser Gly Leu Gln Ser Glu Asp Glu Ala Asp
210 215 220

Tyr Tyr Cys Ala Ala Trp Asp Asp Ser Leu Asn Gly Pro Val Phe Gly
225 230 235 240

Gly Gly Thr Lys Val Thr Val Leu Gly
245

<210> 51

<211> 251
<212> PRT
<213> Artificial Sequence

<220>
<223> single chain fv 7A6

<400> 51

Glu Val Gln Leu Val Gln Ser Gly Ala Glu Val Lys Lys Pro Gly Glu
1 5 10 15

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Ser Leu Thr Ile Ser Cys Lys Gly Ser Gly Tyr Asn Phe Phe Asn Tyr
            20                  25                  30

Trp Ile Gly Trp Val Arg Gln Met Pro Gly Lys Gly Leu Glu Trp Met
        35                  40                  45

Gly Ile Ile Tyr Pro Thr Asp Ser Asp Thr Arg Tyr Ser Pro Ser Phe
    50                  55                  60

Gln Gly Gln Val Thr Ile Ser Val Asp Lys Ser Ile Ser Thr Ala Tyr
65                  70                  75                  80

Leu Gln Trp Ser Ser Leu Lys Ala Ser Asp Thr Ala Met Tyr Tyr Cys
                85                  90                  95

Ala Arg Ser Ile Arg Tyr Cys Pro Gly Gly Arg Cys Tyr Ser Gly Tyr
            100                 105                 110

Tyr Gly Met Asp Val Trp Gly Gln Gly Thr Leu Val Thr Val Ser Ser
        115                 120                 125

Gly Gly Gly Gly Ser Gly Gly Gly Gly Ser Gly Gly Gly Gly Ser Ser
    130                 135                 140

Glu Leu Thr Gln Asp Pro Ala Val Ser Val Ala Leu Gly Gln Thr Val
145                 150                 155                 160

Arg Ile Thr Cys Gln Gly Asp Ser Leu Arg Ser Tyr Tyr Thr Asn Trp
                165                 170                 175

Phe Gln Gln Lys Pro Gly Gln Ala Pro Leu Leu Val Val Tyr Ala Lys
            180                 185                 190

Asn Lys Arg Pro Ser Gly Ile Pro Asp Arg Phe Ser Gly Ser Ser Ser
        195                 200                 205

Gly Asn Thr Ala Ser Leu Thr Ile Thr Gly Ala Gln Ala Glu Asp Glu
    210                 215                 220

Ala Asp Tyr Tyr Cys Asn Ser Arg Asp Ser Ser Gly Asn His Val Val
225                 230                 235                 240
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Phe Gly Gly Gly Thr Lys Leu Thr Val Leu Gly
245 250

<210> 52
<211> 5
<212> PRT
<213> Artificial Sequence

<220>
<223> CDR

<400> 52

Ser Tyr Trp Met His
1 5

<210> 53
<211> 17
<212> PRT
<213> Artificial Sequece

<220>
<223> CDR

<400> 53

Glu Ile Asn Pro Ser Asn Gly Arg Thr Asn Tyr Asn Glu Lys Phe Lys
1 5 10 15

Arg

<210> 54
<211> 15
<212> PRT
<213> Artificial Sequence

<220>
<223> CDR

<400> 54

Gly Arg Pro Asp Tyr Tyr Gly Ser Ser Lys Trp Tyr Phe Asp Val
1 5 10 15

<210> 55
<211> 16
<212> PRT
<213> Artificial Sequence

<220>
<223> CDR

<400> 55

Arg Ser Ser Gln Ser Ile Val His Ser Asn Val Asn Thr Tyr Leu Glu
1 5 10 15

<210> 56
<211> 7
<212> PRT
<213> Artificial Sequence

<220>
<223> CDR

<400> 56

Lys Val Ser Asn Arg Phe Ser
1 5

<210> 57
<211> 9
<212> PRT
<213> Artificial Sequence

<220>
<223> CDR

<400> 57

Phe Gln Gly Ser His Val Pro Pro Thr
1 5

<210> 58
<211> 123
<212> PRT
<213> Artificial Sequence

<220>
<223> heavy chain immunoglobulin variable region

<400> 58

Gln Val Gln Leu Val Gln Ser Gly Ala Glu Val Val Lys Pro Gly Ala
1 5 10 15

Ser Val Lys Leu Ser Cys Lys Ala Ser Gly Tyr Thr Phe Thr Ser Tyr
20 25 30

Trp Met His Trp Val Lys Gln Arg Pro Gly Gln Gly Leu Glu Trp Ile
35 40 45

Gly Glu Ile Asn Pro Ser Asn Gly Arg Thr Asn Tyr Asn Gln Lys Phe
50 55 60

Gln Gly Lys Ala Thr Leu Thr Val Asp Lys Ser Ser Ser Thr Ala Tyr
65 70 75 80

Met Gln Leu Ser Ser Leu Thr Ser Glu Asp Ser Ala Val Tyr Tyr Phe
85 90 95

Ala Arg Gly Arg Pro Asp Tyr Tyr Gly Ser Ser Lys Trp Tyr Phe Asp
100 105 110

Val Trp Gly Gln Gly Thr Thr Val Thr Val Ser
115 120

<210> 59
<211> 118
<212> PRT
<213> Artificial Sequence

<220>
<223> heavy chain immunoglobulin variable region

<400> 59

Gln Val Gln Phe Gln Gln Ser Gly Ala Glu Leu Val Lys Pro Gly Ala
1 5 10 15

Ser Val Lys Leu Ser Cys Lys Ala Ser Gly Tyr Thr Phe Thr Ser Tyr
20 25 30

Leu Met His Trp Ile Lys Gln Arg Pro Gly Arg Gly Leu Glu Trp Ile
35 40 45

Gly Arg Ile Asp Pro Asn Asn Val Val Thr Lys Phe Asn Glu Lys Phe
50 55 60

Lys Ser Lys Ala Thr Leu Thr Val Asp Lys Pro Ser Ser Thr Ala Tyr
65 70 75 80

Met Glu Leu Ser Ser Leu Thr Ser Glu Asp Ser Ala Val Tyr Tyr Cys
85 90 95

Ala Arg Tyr Ala Tyr Cys Arg Pro Met Asp Tyr Trp Gly Gln Gly Thr
100 105 110

Thr Val Thr Val Ser Ser
115

<210> 60
<211> 123
<212> PRT
<213> Artificial Sequence

<220>
<223> heavy chain immunoglobulin variable region

<400> 60

Gln Val Gln Leu Gln Gln Ser Gly Ala Glu Leu Val Lys Pro Gly Ala
1 5 10 15

Ser Val Lys Leu Ser Cys Lys Ala Ser Gly Tyr Thr Phe Thr Ser Tyr
20 25 30

Trp Met His Trp Val Lys Gln Arg Pro Gly Gln Gly Leu Glu Trp Ile
35 40 45

Gly Glu Ile Asn Pro Ser Asn Gly Arg Thr Asn Tyr Asn Glu Lys Phe
50 55 60

Lys Arg Lys Ala Thr Leu Thr Val Asp Lys Ser Ser Ser Thr Ala Tyr
65 70 75 80

Met Gln Leu Ser Ser Leu Thr Ser Glu Asp Ser Ala Val Tyr Tyr Phe
85 90 95

Ala Arg Gly Arg Pro Asp Tyr Tyr Gly Ser Ser Lys Trp Tyr Phe Asp
100 105 110

Val Trp Gly Ala Gly Thr Thr Val Thr Val Ser
115 120

<210> 61

<211> 120
<212> PRT
<213> Artificial Sequence

<220>
<223> heavy chain immunoglobulin variable region

<400> 61

Gln Val Gln Leu Gln Gln Ser Gly Ala Glu Leu Met Lys Pro Gly Ala
1 5 10 15

Ser Val Lys Ile Ser Cys Lys Ala Thr Gly Tyr Thr Phe Ser Ser Phe
20 25 30

Trp Ile Glu Trp Val Lys Gln Arg Pro Gly His Gly Leu Glu Trp Ile
35 40 45

Gly Glu Ile Leu Pro Gly Ser Gly Gly Thr His Tyr Asn Glu Lys Phe
50 55 60

Lys Gly Lys Ala Thr Phe Thr Ala Asp Lys Ser Ser Asn Thr Ala Tyr
65 70 75 80

Met Gln Leu Ser Ser Leu Thr Ser Glu Asp Ser Ala Val Tyr Tyr Cys
85 90 95

Ala Arg Gly His Ser Tyr Tyr Phe Tyr Asp Gly Asp Tyr Trp Gly Gln
100 105 110

Gly Thr Ser Val Thr Val Ser Ser
115 120

<210> 62
<211> 120
<212> PRT
<213> Artificial Sequence

<220>
<223> heavy chain immunoglobulin variable region

<400> 62

Gln Val Gln Leu Gln Gln Pro Gly Ser Val Leu Val Arg Pro Gly Ala
1 5 10 15

Ser Val Lys Leu Ser Cys Lys Ala Ser Gly Tyr Thr Phe Thr Ser Ser
20 25 30

Trp Ile His Trp Ala Lys Gln Arg Pro Gly Gln Gly Leu Glu Trp Ile
35 40 45

Gly Glu Ile His Pro Asn Ser Gly Asn Thr Asn Tyr Asn Glu Lys Phe
50 55 60

Lys Gly Lys Ala Thr Leu Thr Val Asp Thr Ser Ser Ser Thr Ala Tyr
65 70 75 80

Val Asp Leu Ser Ser Leu Thr Ser Glu Asp Ser Ala Val Tyr Tyr Cys
85 90 95

Ala Arg Trp Arg Tyr Gly Ser Pro Tyr Tyr Phe Asp Tyr Trp Gly Gln
100 105 110

Gly Thr Thr Leu Thr Val Ser Ser
115 120

<210> 63
<211> 120
<212> PRT
<213> Artificial Sequence

<220>
<223> heavy chain immunoglobulin variable region

<400> 63

Gln Val Gln Leu Gln Gln Pro Gly Ala Glu Leu Val Lys Pro Gly Ala
1 5 10 15

Ser Val Lys Leu Ser Cys Lys Ala Ser Gly Tyr Thr Phe Thr Ser Tyr
20 25 30

Trp Met His Trp Val Lys Gln Arg Pro Gly Arg Gly Leu Glu Trp Ile
35 40 45

Gly Arg Ile Asp Pro Asn Ser Gly Gly Thr Lys Tyr Asn Glu Lys Phe
50 55 60

Lys Ser Lys Ala Thr Leu Thr Val Asp Lys Pro Ser Ser Thr Ala Tyr
65 70 75 80

Met Gln Leu Ser Ser Leu Thr Ser Glu Asp Ser Ala Val Tyr Tyr Cys
85 90 95

Ala Arg Tyr Asp Tyr Tyr Gly Ser Ser Tyr Phe Asp Tyr Trp Gly Gln
100 105 110

Gly Thr Thr Leu Thr Val Ser Ser
115 120

<210> 64
<211> 123
<212> PRT
<213> Artificial Sequence

<220>

<223> heavy chain immunoglobulin variable region

<400> 64

Gln Val Gln Leu Val Gln Ser Gly Ala Glu Val Val Lys Pro Gly Ala
1 5 10 15

Ser Val Lys Leu Ser Cys Lys Ala Ser Gly Tyr Thr Phe Thr Ser Tyr
20 25 30

Trp Met His Trp Val Lys Gln Arg Pro Gly Gln Gly Leu Glu Trp Ile
35 40 45

Gly Glu Ile Asn Pro Ser Asn Gly Arg Thr Asn Tyr Asn Gln Lys Phe
50 55 60

Gln Gly Lys Ala Thr Leu Thr Val Asp Lys Ser Ser Ser Thr Ala Tyr
65 70 75 80

Met Gln Leu Ser Ser Leu Thr Ser Glu Asp Ser Ala Val Tyr Tyr Phe
85 90 95

Ala Arg Gly Arg Pro Asp Tyr Tyr Gly Ser Ser Lys Trp Tyr Phe Asp
100 105 110

Val Trp Gly Gln Gly Thr Thr Val Thr Val Ser
115 120

<210> 65
<211> 124
<212> PRT
<213> Artificial Sequence

<220>
<223> heavy chain immunoglobulin variable region

<400> 65

Gln Val Gln Leu Gln Gln Ser Gly Ala Glu Leu Val Lys Pro Gly Ala
1 5 10 15

Ser Val Lys Leu Ser Cys Lys Ala Ser Gly Tyr Thr Phe Thr Ser Tyr
20 25 30

Trp Met His Trp Val Lys Gln Arg Pro Gly Gln Gly Leu Glu Trp Ile
35 40 45

Gly Glu Ile Asn Pro Ser Asn Gly Arg Thr Asn Tyr Asn Glu Lys Phe
50 55 60

Lys Arg Lys Ala Thr Leu Thr Val Asp Lys Ser Ser Ser Thr Ala Tyr
65 70 75 80

Met Gln Leu Ser Ser Leu Thr Ser Glu Asp Ser Ala Val Tyr Tyr Phe
85 90 95

Ala Arg Gly Arg Pro Asp Tyr Tyr Gly Ser Ser Lys Trp Tyr Phe Asp
100 105 110

Val Trp Gly Ala Gly Thr Thr Val Thr Val Ser Ser
115 120

<210> 66
<211> 124
<212> PRT
<213> Artificial Sequence

<220>
<223> heavy chain immunoglobulin variable region

<400> 66

Gln Val Gln Leu Val Gln Ser Gly Ala Glu Val Val Lys Pro Gly Ala
1 5 10 15

Ser Val Lys Leu Ser Cys Lys Ala Ser Gly Tyr Thr Phe Thr Ser Tyr
20 25 30

Trp Met His Trp Val Lys Gln Arg Pro Gly Gln Gly Leu Glu Trp Ile
35 40 45

Gly Glu Ile Asn Pro Ser Asn Gly Arg Thr Asn Tyr Asn Gln Lys Phe
50 55 60

Gln Gly Lys Ala Thr Leu Thr Val Asp Lys Ser Ser Ser Thr Ala Tyr
65 70 75 80

Met Gln Leu Ser Ser Leu Thr Ser Glu Asp Ser Ala Val Tyr Tyr Phe
85 90 95

Ala Arg Gly Arg Pro Asp Tyr Tyr Gly Ser Ser Lys Trp Tyr Phe Asp
100 105 110

Val Trp Gly Gln Gly Thr Thr Val Thr Val Ser Ser
115 120

<210> 67
<211> 120
<212> PRT
<213> Artificial Sequence

<220>
<223> heavy chain immunoglobulin variable region

<400> 67

Gln Val Gln Leu Gln Gln Ser Gly Ala Glu Leu Val Lys Pro Gly Ala
1 5 10 15

Ser Val Lys Leu Ser Cys Lys Ala Ser Gly Tyr Thr Phe Thr Ser Tyr
20 25 30

Trp Met His Trp Val Lys Gln Arg Pro Gly Arg Gly Leu Glu Trp Ile
35 40 45

Gly Arg Ile Asp Pro Asn Ser Gly Gly Thr Lys Tyr Asn Glu Lys Phe
50 55 60

Lys Ser Lys Ala Thr Leu Thr Val Asp Lys Pro Ser Ser Thr Ala Tyr
65 70 75 80

Met Gln Leu Ser Ser Leu Thr Ser Glu Asp Ser Ala Val Tyr Tyr Cys
85 90 95

Ala Arg Tyr Asp Tyr Tyr Gly Ser Ser Tyr Phe Asp Tyr Trp Gly Gln
100 105 110

Gly Thr Thr Val Thr Val Ser Ser
115 120

<210> 68
<211> 117
<212> PRT
<213> Artificial Sequence

<220>
<223> heavy chain immunoglobulin variable region

<400> 68

Gln Ile Gln Leu Gln Gln Ser Gly Pro Glu Leu Val Arg Pro Gly Ala
1 5 10 15

Ser Val Lys Ile Ser Cys Lys Ala Ser Gly Tyr Thr Phe Thr Asp Tyr
20 25 30

Tyr Ile His Trp Val Lys Gln Arg Pro Gly Glu Gly Leu Glu Trp Ile
35 40 45

Gly Trp Ile Tyr Pro Gly Ser Gly Asn Thr Lys Tyr Asn Glu Lys Phe
50 55 60

Lys Gly Lys Ala Thr Leu Thr Val Asp Thr Ser Ser Ser Thr Ala Tyr
65 70 75 80

Met Gln Leu Ser Ser Leu Thr Ser Glu Asp Ser Ala Val Tyr Phe Cys
85 90 95

Ala Arg Gly Gly Lys Phe Ala Met Asp Tyr Trp Gly Gln Gly Thr Ser
100 105 110

Val Thr Val Ser Ser
115

<210> 69
<211> 124
<212> PRT
<213> Artificial Sequence

<220>
<223> heavy chain immunoglobulin variable region

<400> 69

Gln Val Gln Leu Gln Gln Ser Gly Ala Glu Leu Val Lys Pro Gly Ala
1 5 10 15

Ser Val Lys Leu Ser Cys Lys Ala Ser Gly Tyr Thr Phe Thr Ser Tyr
20 25 30

Trp Met His Trp Val Lys Gln Arg Pro Gly Gln Gly Leu Glu Trp Ile
35 40 45

Gly Glu Ile Asn Pro Ser Asn Gly Arg Thr Asn Tyr Asn Glu Lys Phe
50 55 60

Lys Arg Lys Ala Thr Leu Thr Val Asp Lys Ser Ser Ser Thr Ala Tyr
65 70 75 80

Met Gln Leu Ser Ser Leu Thr Ser Glu Asp Ser Ala Val Tyr Tyr Phe
85 90 95

Ala Arg Gly Arg Pro Asp Tyr Tyr Gly Ser Ser Lys Trp Tyr Phe Asp
100 105 110

Val Trp Gly Ala Gly Thr Thr Val Thr Val Ser Ser
115 120

<210> 70
<211> 120
<212> PRT
<213> Artificial Sequence

<220>
<223> heavy chain immunoglobulin variable region

<400> 70

Gln Ile Gln Leu Gln Gln Ser Gly Pro Glu Leu Val Lys Pro Gly Ala
1 5 10 15

Ser Val Lys Ile Ser Cys Lys Ala Ser Gly Tyr Thr Phe Thr Asp Tyr
20 25 30

Tyr Ile Asn Trp Met Lys Gln Lys Pro Gly Gln Gly Leu Glu Trp Ile
35 40 45

Gly Trp Ile Asp Pro Gly Ser Gly Asn Thr Lys Tyr Asn Glu Lys Phe
50 55 60

Lys Gly Lys Ala Thr Leu Thr Val Asp Thr Ser Ser Ser Thr Ala Tyr
65 70 75 80

Met Gln Leu Ser Ser Leu Thr Ser Glu Asp Thr Ala Val Tyr Phe Cys
85 90 95

Ala Arg Glu Lys Thr Thr Tyr Tyr Tyr Ala Met Asp Tyr Trp Gly Gln
100 105 110

Gly Thr Ser Val Thr Val Ser Ala
115 120

<210> 71
<211> 115

<212> PRT
<213> Artificial Sequence

<220>
<223> heavy chain immunoglobulin variable region

<400> 71

Val Gln Leu Gln Gln Ser Gly Ala Glu Leu Met Lys Pro Gly Ala Ser
1 5 10 15

Val Lys Ile Ser Cys Lys Ala Ser Gly Tyr Thr Phe Ser Asp Tyr Trp
20 25 30

Ile Glu Trp Val Lys Gln Arg Pro Gly His Gly Leu Glu Trp Ile Gly
35 40 45

Glu Ile Leu Pro Gly Ser Gly Ser Thr Asn Tyr His Glu Arg Phe Lys
50 55 60

Gly Lys Ala Thr Phe Thr Ala Asp Thr Ser Ser Ser Thr Ala Tyr Met
65 70 75 80

Gln Leu Asn Ser Leu Thr Ser Glu Asp Ser Gly Val Tyr Tyr Cys Leu
85 90 95

His Gly Asn Tyr Asp Phe Asp Gly Trp Gly Gln Gly Thr Thr Leu Thr
100 105 110

Val Ser Ser
115

<210> 72
<211> 120
<212> PRT
<213> Artificial Sequence

<220>
<223> heavy chain immunoglobulin variable region

<400> 72

Gln Val Gln Leu Leu Glu Ser Gly Ala Glu Leu Met Lys Pro Gly Ala
1 5 10 15

Ser Val Lys Ile Ser Cys Lys Ala Thr Gly Tyr Thr Phe Ser Ser Phe
20 25 30

Trp Ile Glu Trp Val Lys Gln Arg Pro Gly His Gly Leu Glu Trp Ile
35 40 45

Gly Glu Ile Leu Pro Gly Ser Gly Gly Thr His Tyr Asn Glu Lys Phe
50 55 60

Lys Gly Lys Ala Thr Phe Thr Ala Asp Lys Ser Ser Asn Thr Ala Tyr
65 70 75 80

Met Gln Leu Ser Ser Leu Thr Ser Glu Asp Ser Ala Val Tyr Tyr Cys
85 90 95

Ala Arg Gly His Ser Tyr Tyr Phe Tyr Asp Gly Asp Tyr Trp Gly Gln
100 105 110

Gly Thr Ser Val Thr Val Ser Ser
115 120

<210> 73
<211> 113
<212> PRT
<213> Artificial Sequence

<220>
<223> light chain immunoglobulin variable region

<400> 73

Asp Val Leu Met Thr Gln Ile Pro Val Ser Leu Pro Val Ser Leu Gly
1 5 10 15

Asp Gln Ala Ser Ile Ser Cys Arg Ser Ser Gln Ile Ile Val His Asn
20 25 30

Asn Gly Asn Thr Tyr Leu Glu Trp Tyr Leu Gln Lys Pro Gly Gln Ser
35 40 45

Pro Gln Leu Leu Ile Tyr Lys Val Ser Asn Arg Phe Ser Gly Val Pro
50 55 60

Asp Arg Phe Ser Gly Ser Gly Ser Gly Thr Asp Phe Thr Leu Lys Ile
65 70 75 80

Ser Arg Val Glu Ala Glu Asp Leu Gly Val Tyr Tyr Cys Phe Gln Gly
85 90 95

Ser His Val Pro Phe Thr Phe Gly Ser Gly Thr Lys Leu Glu Ile Lys
100 105 110

Arg

<210> 74
<211> 113
<212> PRT
<213> Artificial Sequence

<220>
<223> light chain immunoglobulin variable region

<400> 74

Asp Val Leu Met Thr Gln Thr Pro Leu Ser Leu Pro Val Ser Leu Gly
1 5 10 15

Asp Pro Ala Ser Ile Ser Cys Arg Ser Ser Gln Ser Ile Val His Ser
20 25 30

Asn Val Asn Thr Tyr Leu Glu Trp Tyr Leu Gln Lys Pro Gly Gln Ser
35 40 45

Pro Lys Leu Leu Ile Tyr Lys Val Ser Asn Arg Phe Ser Gly Val Pro
50 55 60

Asp Arg Phe Ser Gly Ser Gly Ala Gly Thr Asp Phe Thr Leu Arg Ile
65 70 75 80

Ser Arg Val Glu Ala Glu Asp Leu Gly Ile Tyr Tyr Cys Phe Gln Gly
85 90 95

Ser His Val Pro Pro Thr Phe Gly Gly Gly Thr Lys Leu Glu Ile Lys
100 105 110

Arg

<210> 75
<211> 113
<212> PRT
<213> Artificial Sequence

<220>
<223> light chain immunoglobulin variable region

<400> 75

Asp Val Leu Met Thr Gln Thr Pro Leu Ser Leu Pro Val Ser Leu Gly
1 5 10 15

Asp Pro Ala Ser Ile Ser Cys Arg Ser Ser Gln Ser Ile Val His Ser
20 25 30

Asn Val Asn Thr Tyr Leu Glu Trp Tyr Leu Gln Lys Pro Gly Gln Ser
35 40 45

Pro Arg Leu Leu Ile Tyr Lys Val Ser Asn Arg Phe Ser Gly Val Pro
50 55 60

Asp Arg Phe Ser Gly Ser Gly Ala Gly Thr Asp Phe Thr Leu Arg Ile
65 70 75 80

Ser Arg Val Glu Ala Glu Asp Leu Gly Ile Tyr Tyr Cys Phe Gln Gly
85 90 95

Ser His Val Pro Pro Thr Phe Gly Gly Gly Thr Lys Leu Glu Ile Lys
100 105 110

Arg

<210> 76
<211> 113
<212> PRT
<213> Artificial Sequence

<220>
<223> light chain immunoglobulin variable region

<400> 76

Asp Val Leu Met Thr Gln Thr Pro Leu Ser Leu Pro Val Ser Leu Gly
1 5 10 15

Asp Pro Ala Ser Ile Ser Cys Arg Ser Ser Gln Ser Ile Val His Ser
20 25 30

Asn Val Asn Thr Tyr Leu Glu Trp Tyr Leu Gln Lys Pro Gly Gln Ser
35 40 45

Pro Lys Leu Leu Ile Tyr Lys Val Ser Asn Arg Phe Ser Gly Val Pro
50 55 60

Asp Arg Phe Ser Gly Ser Gly Ala Gly Thr Asp Phe Thr Leu Arg Ile
65 70 75 80

Ser Arg Val Glu Ala Glu Asp Leu Gly Ile Tyr Tyr Cys Phe Gln Gly
85 90 95

Ser His Val Pro Pro Thr Phe Gly Gly Gly Thr Lys Leu Glu Ile Lys
100 105 110

Arg

<210> 77
<211> 113
<212> PRT
<213> Artificial Sequence

<220>
<223> light chain immunoglobulin variable region

<400> 77

Asp Val Leu Met Thr Gln Thr Pro Leu Ser Leu Pro Val Ser Leu Gly
1 5 10 15

Asp Pro Ala Ser Ile Ser Cys Arg Ser Ser Gln Ser Ile Val His Ser
20 25 30

Asn Val Asn Thr Tyr Leu Glu Trp Tyr Leu Gln Lys Pro Gly Gln Ser
35 40 45

Pro Arg Leu Leu Ile Tyr Lys Val Ser Asn Arg Phe Ser Gly Val Pro
50 55 60

Asp Arg Phe Ser Gly Ser Gly Ala Gly Thr Asp Phe Thr Leu Arg Ile
65 70 75 80

Ser Arg Val Glu Ala Glu Asp Leu Gly Ile Tyr Tyr Cys Phe Gln Gly
85 90 95

Ser His Val Pro Pro Thr Phe Gly Gly Gly Thr Lys Leu Glu Ile Lys
100 105 110

Arg

<210> 78
<211> 113
<212> PRT
<213> Artificial Sequence

<220>
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<220>
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<222> (28)..(28)
<223> Xaa can be any naturally occurring amino acid

<220>
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<222> (101)..(101)
<223> Xaa can be any naturally occurring amino acid
<400> 78

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Asp Val Leu Met Thr Gln Thr Pro Leu Ser Leu Pro Val Ser Leu Gly
1               5                  10                  15

Asp Gln Ala Ser Ile Ser Cys Arg Ser Ser Gln Xaa Ile Val His Ser
            20                  25                  30

Asn Gly Asn Thr Tyr Leu Glu Trp Tyr Leu Gln Lys Pro Gly Gln Ser
        35                  40                  45

Pro Lys Leu Leu Ile Tyr Lys Val Ser Asn Arg Phe Ser Gly Val Pro
    50                  55                  60

Asp Arg Phe Ser Gly Ser Gly Ser Gly Thr Asp Phe Thr Leu Lys Ile
65                  70                  75                  80

Ser Arg Val Glu Ala Glu Asp Leu Gly Val Tyr Tyr Cys Phe Gln Gly
                85                  90                  95

Ser His Val Pro Xaa Thr Phe Gly Gly Gly Thr Lys Leu Glu Ile Lys
            100                 105                 110

Arg
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<210> 79
<211> 113
<212> PRT

<213> Artificial Sequence

<220>
<223> light chain immunoglobulin variable region

<400> 79

Asp Val Val Met Thr Gln Thr Pro Leu Ser Leu Pro Val Ser Leu Gly
1 5 10 15

Asp Pro Ala Ser Ile Ser Cys Arg Ser Ser Gln Ser Ile Val His Ser
20 25 30

Asn Val Asn Thr Tyr Leu Glu Trp Tyr Leu Gln Lys Pro Gly Gln Ser
35 40 45

Pro Lys Leu Leu Ile Tyr Lys Val Ser Asn Arg Phe Ser Gly Val Pro
50 55 60

Asp Arg Phe Ser Gly Ser Gly Ala Gly Thr Asp Phe Thr Leu Arg Ile
65 70 75 80

Ser Arg Val Glu Ala Glu Asp Leu Gly Ile Tyr Tyr Cys Phe Gln Gly
85 90 95

Ser His Val Pro Pro Thr Phe Gly Gly Gly Thr Lys Leu Glu Ile Lys
100 105 110

Arg

<210> 80
<211> 113
<212> PRT
<213> Artificial Sequence

<220>
<223> light chain immunoglobulin variable region

<400> 80

Asp Val Val Met Thr Gln Thr Pro Leu Ser Leu Pro Val Ser Leu Gly
1 5 10 15

Asp Pro Ala Ser Ile Ser Cys Arg Ser Ser Gln Ser Ile Val His Ser
20 25 30

Asn Val Asn Thr Tyr Leu Glu Trp Tyr Leu Gln Lys Pro Gly Gln Ser
35 40 45

Pro Arg Leu Leu Ile Tyr Lys Val Ser Asn Arg Phe Ser Gly Val Pro
50 55 60

Asp Arg Phe Ser Gly Ser Gly Ala Gly Thr Asp Phe Thr Leu Arg Ile
65 70 75 80

Ser Arg Val Glu Ala Glu Asp Leu Gly Ile Tyr Tyr Cys Phe Gln Gly
85 90 95

Ser His Val Pro Pro Thr Phe Gly Gly Gly Thr Lys Leu Glu Ile Lys
100 105 110

Arg

<210> 81
<211> 113
<212> PRT
<213> Artificial Sequence

<220>
<223> light chain immunoglobulin variable region

<400> 81

Asp Val Leu Met Thr Gln Thr Pro Leu Ser Leu Pro Val Ser Leu Gly
1 5 10 15

Asp Pro Ala Ser Ile Ser Cys Arg Ser Ser Gln Ser Ile Val His Ser
20 25 30

Asn Val Asn Thr Tyr Leu Glu Trp Tyr Leu Gln Lys Pro Gly Gln Ser
35 40 45

Pro Arg Leu Leu Ile Tyr Lys Val Ser Asn Arg Phe Ser Gly Val Pro
50 55 60

Asp Arg Phe Ser Gly Ser Gly Ala Gly Thr Asp Phe Thr Leu Arg Ile
65 70 75 80

Ser Arg Val Glu Ala Glu Asp Leu Gly Ile Tyr Tyr Cys Phe Gln Gly
85 90 95

Ser His Val Pro Pro Thr Phe Gly Gly Gly Thr Lys Leu Glu Ile Lys
100 105 110

Arg

<210> 82
<211> 113
<212> PRT
<213> Artificial Sequence

<220>
<223> light chain immunoglobulin variable region

<400> 82

Asp Val Leu Met Thr Gln Ile Pro Val Ser Leu Pro Val Ser Leu Gly
1 5 10 15

Asp Gln Ala Ser Ile Ser Cys Arg Ser Ser Gln Ile Ile Val His Asn
20 25 30

Asn Gly Asn Thr Tyr Leu Glu Trp Tyr Leu Gln Lys Pro Gly Gln Ser
35 40 45

Pro Gln Leu Leu Ile Tyr Lys Val Ser Asn Arg Phe Ser Gly Val Pro
50 55 60

Asp Arg Phe Ser Gly Ser Gly Ser Gly Thr Asp Phe Thr Leu Lys Ile
65 70 75 80

Ser Arg Val Glu Ala Glu Asp Leu Gly Val Tyr Tyr Cys Phe Gln Gly
85 90 95

Ser His Val Pro Phe Thr Phe Gly Ser Gly Thr Lys Leu Glu Ile Lys
100 105 110

Arg

<210> 83
<211> 113
<212> PRT
<213> Artificial Sequence

<220>
<223> light chain immunoglobulin variable region

<400> 83

Asp Val Leu Met Thr Gln Thr Pro Leu Ser Leu Pro Val Ser Leu Gly
1 5 10 15

Asp Gln Ala Ser Ile Ser Cys Arg Phe Ser Gln Ser Ile Val His Ser
20 25 30

Asn Gly Asn Thr Tyr Leu Glu Trp Tyr Leu Gln Lys Ser Gly Gln Ser
35 40 45

Pro Lys Leu Leu Ile Tyr Lys Val Ser Asn Arg Phe Ser Gly Val Pro
50 55 60

Asp Arg Phe Ser Gly Ser Gly Ser Gly Thr Asp Phe Thr Leu Lys Ile
65 70 75 80

Ser Arg Val Glu Ala Glu Asp Leu Gly Val Tyr Tyr Cys Phe Gln Gly
85 90 95

Ser His Val Pro Arg Thr Phe Gly Gly Gly Thr Lys Leu Glu Ile Lys
100 105 110

Arg

<210> 84
<211> 113
<212> PRT
<213> Artificial Sequence

<220>
<223> light chain immunoglobulin variable region

<400> 84

Asp Val Leu Met Thr Gln Thr Pro Leu Ser Leu Pro Val Ser Leu Gly
1 5 10 15

Asp Gln Ala Ser Ile Ser Cys Arg Ser Ser Gln Ser Ile Val His Ser
20 25 30

Asn Val Asn Thr Tyr Leu Glu Trp Tyr Leu Gln Lys Pro Gly Gln Ser
35 40 45

Pro Lys Leu Leu Ile Tyr Lys Val Ser Asn Arg Phe Ser Gly Val Pro
50 55 60

Asp Arg Phe Ser Gly Ser Gly Ser Gly Thr Asp Phe Thr Leu Arg Ile
65 70 75 80

Ser Arg Val Glu Ala Glu Asp Leu Gly Ile Tyr Tyr Cys Phe Gln Gly
85 90 95

Ser His Val Pro Pro Thr Phe Gly Gly Gly Thr Lys Leu Glu Ile Lys
100 105 110

Arg

<210> 85
<211> 113
<212> PRT
<213> Artificial Sequence

<220>
<223> light chain immunoglobulin variable region

<400> 85

Asp Val Val Met Thr Gln Thr Pro Leu Ser Leu Pro Val Ser Leu Gly
1 5 10 15

Asp Pro Ala Ser Ile Ser Cys Arg Ser Ser Gln Ser Ile Val His Ser
20 25 30

Asn Val Asn Thr Tyr Leu Glu Trp Tyr Leu Gln Lys Pro Gly Gln Ser
35 40 45

Pro Lys Leu Leu Ile Tyr Lys Val Ser Asn Arg Phe Ser Gly Val Pro
50 55 60

Asp Arg Phe Ser Gly Ser Gly Ala Gly Thr Asp Phe Thr Leu Arg Ile
65 70 75 80

Ser Arg Val Glu Ala Glu Asp Leu Gly Ile Tyr Tyr Cys Phe Gln Gly
85 90 95

Ser His Val Pro Pro Thr Phe Gly Gly Gly Thr Lys Leu Glu Ile Lys
100 105 110

Arg

<210> 86
<211> 113
<212> PRT
<213> Artificial Sequence

<220>
<223> light chain immunoglobulin variable region

<400> 86

Glu Leu Val Met Thr Gln Thr Pro Leu Ser Leu Pro Val Ser Leu Gly
1 5 10 15

Asp Gln Ala Ser Ile Ser Cys Arg Ser Ser Gln Thr Ile Val His Ser
20 25 30

Asn Gly Asp Thr Tyr Leu Asp Trp Phe Leu Gln Lys Pro Gly Gln Ser
35 40 45

Pro Lys Leu Leu Ile Tyr Lys Val Ser Asn Arg Phe Ser Gly Val Pro
50 55 60

Asp Arg Phe Ser Gly Ser Gly Ser Gly Thr Asp Phe Thr Leu Lys Ile
65 70 75 80

Ser Arg Val Glu Ala Glu Asp Leu Gly Val Tyr Tyr Cys Phe Gln Gly
85 90 95

Ser His Val Pro Pro Thr Phe Gly Gly Gly Thr Lys Leu Glu Ile Lys
100 105 110

Arg

<210> 87
<211> 113
<212> PRT
<213> Artificial Sequence

<220>
<223> light chain immunoglobulin variable region

<400> 87

Asp Val Leu Met Thr Gln Thr Pro Leu Ser Leu Pro Val Ser Leu Gly
1 5 10 15

Asp Pro Ala Ser Ile Ser Cys Arg Ser Ser Gln Ser Ile Val His Ser
20 25 30

Asn Val Asn Thr Tyr Leu Glu Trp Tyr Leu Gln Lys Pro Gly Gln Ser
35 40 45

Pro Lys Leu Leu Ile Tyr Lys Val Ser Asn Arg Phe Ser Gly Val Pro
50 55 60

Asp Arg Phe Ser Gly Ser Gly Ala Gly Thr Asp Phe Thr Leu Arg Ile
65 70 75 80

Ser Arg Val Glu Ala Glu Asp Leu Gly Ile Tyr Tyr Cys Phe Gln Gly
85 90 95

Ser His Val Pro Pro Thr Phe Gly Gly Gly Thr Lys Leu Glu Ile Lys
100 105 110

Arg

<210> 88
<211> 113
<212> PRT
<213> Artificial Sequence
<220>
<223> light chain immunoglobulin variable region

<400> 88

Asp Val Val Met Thr Gln Thr Pro Leu Ser Leu Pro Val Ser Leu Gly
1 5 10 15

Asp Pro Ala Ser Ile Ser Cys Arg Ser Ser Gln Ser Ile Val His Ser
20 25 30

Asn Val Asn Thr Tyr Leu Glu Trp Tyr Leu Gln Lys Pro Gly Gln Ser
35 40 45

Pro Arg Leu Leu Ile Tyr Lys Val Ser Asn Arg Phe Ser Gly Val Pro
50 55 60

Asp Arg Phe Ser Gly Ser Gly Ala Gly Thr Asp Phe Thr Leu Arg Ile
65 70 75 80

Ser Arg Val Glu Ala Glu Asp Leu Gly Ile Tyr Tyr Cys Phe Gln Gly
85 90 95

Ser His Val Pro Pro Thr Phe Gly Gly Gly Thr Lys Leu Glu Ile Lys
100 105 110

Arg

<210> 89
<211> 113
<212> PRT
<213> Artificial Sequence

<220>
<223> light chain immunoglobulin variable region

<400> 89

Asp Val Leu Met Thr Gln Thr Pro Val Ser Leu Ser Val Ser Leu Gly
1 5 10 15

Asp Gln Ala Ser Ile Ser Cys Arg Ser Ser Gln Ser Ile Val His Ser
20 25 30

Thr Gly Asn Thr Tyr Leu Glu Trp Tyr Leu Gln Lys Pro Gly Gln Ser
35 40 45

Pro Lys Leu Leu Ile Tyr Lys Ile Ser Asn Arg Phe Ser Gly Val Pro
50 55 60

Asp Arg Phe Ser Gly Ser Gly Ser Gly Thr Asp Phe Thr Leu Lys Ile
65 70 75 80

Ser Arg Val Glu Ala Glu Asp Leu Gly Val Tyr Tyr Cys Phe Gln Ala
85 90 95

Ser His Ala Pro Arg Thr Phe Gly Gly Gly Thr Lys Leu Glu Ile Lys
100 105 110

Arg

<210> 90
<211> 113
<212> PRT
<213> Artificial Sequence

<220>
<223> light chain immunoglobulin variable region

<400> 90

Asp Val Leu Met Thr Gln Thr Pro Leu Ser Leu Pro Val Ser Leu Gly
1 5 10 15

Asp Gln Ala Ser Ile Ser Cys Lys Ser Ser Gln Ser Ile Val His Ser
20 25 30

Ser Gly Asn Thr Tyr Phe Glu Trp Tyr Leu Gln Lys Pro Gly Gln Ser
35 40 45

Pro Lys Leu Leu Ile Tyr Lys Val Ser Asn Arg Phe Ser Gly Val Pro
50 55 60

Asp Arg Phe Ser Gly Ser Gly Ser Gly Thr Asp Phe Thr Leu Lys Ile
65 70 75 80

Ser Arg Val Glu Ala Glu Asp Leu Gly Val Tyr Tyr Cys Phe Gln Gly
85 90 95

Ser His Ile Pro Phe Thr Phe Gly Ser Gly Thr Lys Leu Glu Ile Lys
100 105 110

Arg

<210> 91
<211> 113
<212> PRT
<213> Artificial Sequence

<220>
<223> light chain immunoglobulin variable region

<400> 91

Asp Ile Glu Leu Thr Gln Thr Pro Leu Ser Leu Pro Val Ser Leu Gly
1 5 10 15

Asp Gln Ala Ser Ile Ser Cys Arg Ser Ser Gln Ser Ile Val His Ser
20 25 30

Asn Gly Asn Thr Tyr Leu Glu Trp Tyr Leu Gln Lys Pro Gly Gln Ser
35 40 45

Pro Lys Leu Leu Ile Tyr Lys Val Ser Asn Arg Phe Ser Gly Val Pro

50 55 60

Asp Arg Phe Ser Gly Ser Gly Ser Gly Thr Asp Phe Thr Leu Lys Ile
65 70 75 80

Ser Arg Val Glu Ala Glu Asp Leu Gly Val Tyr Tyr Cys Phe Gln Gly
85 90 95

Ser His Val Pro Tyr Thr Phe Gly Gly Gly Thr Lys Leu Glu Ile Lys
100 105 110

Arg

<210> 92
<211> 113
<212> PRT

<213> Artificial Sequence

<220>
<223> light chain immunoglobulin variable region

<400> 92

Asp Val Leu Met Thr Gln Thr Pro Leu Ser Leu Pro Val Ser Leu Gly
1 5 10 15

Asp Gln Ala Ser Ile Ser Cys Arg Ser Ser Gln Ser Ile Val His Ser
20 25 30

Asn Val Asn Thr Tyr Leu Glu Trp Tyr Leu Gln Lys Pro Gly Gln Ser
35 40 45

Pro Lys Leu Leu Ile Tyr Lys Val Ser Asn Arg Phe Ser Gly Val Pro
50 55 60

Asp Arg Phe Ser Gly Ser Gly Ser Gly Thr Asp Phe Thr Leu Arg Ile
65 70 75 80

Ser Arg Val Glu Ala Glu Asp Leu Gly Ile Tyr Tyr Cys Phe Gln Gly
85 90 95

Ser His Val Pro Pro Thr Phe Gly Gly Gly Thr Lys Leu Glu Ile Lys
100 105 110

Arg

<210> 93
<211> 113
<212> PRT
<213> Artificial Sequence

<220>
<223> light chain immunoglobulin variable region

<400> 93

Asp Val Val Met Thr Gln Thr Pro Leu Ser Leu Pro Val Ser Leu Gly
1 5 10 15

Asp Pro Ala Ser Ile Ser Cys Arg Ser Ser Gln Ser Ile Val His Ser
20 25 30

Asn Val Asn Thr Tyr Leu Glu Trp Tyr Leu Gln Lys Pro Gly Gln Ser
35 40 45

Pro Arg Leu Leu Ile Tyr Lys Val Ser Asn Arg Phe Ser Gly Val Pro
50 55 60

Asp Arg Phe Ser Gly Ser Gly Ala Gly Thr Asp Phe Thr Leu Arg Ile
65 70 75 80

Ser Arg Val Glu Ala Glu Asp Leu Gly Ile Tyr Tyr Cys Phe Gln Gly
85 90 95

Ser His Val Pro Pro Thr Phe Gly Gly Gly Thr Lys Leu Glu Ile Lys
100 105 110

Arg

<210> 94
<211> 113
<212> PRT
<213> Artificial Sequence

<220>
<223> light chain immunoglobulin variable region

<400> 94

Asp Val Leu Met Thr Gln Thr Pro Leu Ser Leu Pro Val Ser Leu Gly
1 5 10 15

Asp Gln Ala Ser Ile Ser Cys Arg Ser Ser Gln Ser Ile Val His Ser
20 25 30

Asn Val Asn Thr Tyr Leu Glu Trp Tyr Leu Gln Lys Pro Gly Gln Ser
35 40 45

Pro Lys Leu Leu Ile Tyr Lys Val Ser Asn Arg Phe Ser Gly Val Pro
50 55 60

Asp Arg Phe Ser Gly Ser Gly Ser Gly Thr Asp Phe Thr Leu Arg Ile
65 70 75 80

Ser Arg Val Glu Ala Glu Asp Leu Gly Ile Tyr Tyr Cys Phe Gln Gly
85 90 95

Ser His Val Pro Pro Thr Phe Gly Gly Gly Thr Lys Leu Glu Ile Lys
100 105 110

Arg

<210> 95
<211> 113
<212> PRT
<213> Artificial Sequence

<220>
<223> light chain immunoglobulin variable region

<400> 95

Asp Val Val Met Thr Gln Thr Pro Leu Ser Leu Pro Val Ser Leu Gly
1 5 10 15

Asp Pro Ala Ser Ile Ser Cys Arg Ser Ser Gln Ser Ile Val His Ser
20 25 30

Asn Val Asn Thr Tyr Leu Glu Trp Tyr Leu Gln Lys Pro Gly Gln Ser
35 40 45

Pro Lys Leu Leu Ile Tyr Lys Val Ser Asn Arg Phe Ser Gly Val Pro
50 55 60

Asp Arg Phe Ser Gly Ser Gly Ala Gly Thr Asp Phe Thr Leu Arg Ile
65 70 75 80

Ser Arg Val Glu Ala Glu Asp Leu Gly Ile Tyr Tyr Cys Phe Gln Gly
85 90 95

Ser His Val Pro Pro Thr Phe Gly Gly Gly Thr Lys Leu Glu Ile Lys
100 105 110

Arg

<210> 96
<211> 113
<212> PRT
<213> Artificial Sequence

<220>
<223> light chain immunoglobulin variable region

<400> 96

Asp Val Leu Met Thr Gln Thr Pro Leu Ser Leu Pro Val Ser Leu Gly
1 5 10 15

Asp Gln Ala Ser Ile Ser Cys Arg Ser Asn Gln Thr Ile Leu Leu Ser
20 25 30

Asp Gly Asp Thr Tyr Leu Glu Trp Tyr Leu Gln Lys Pro Gly Gln Ser
35 40 45

Pro Lys Leu Leu Ile Tyr Lys Val Ser Asn Arg Phe Ser Gly Val Pro
50 55 60

Asp Arg Phe Ser Gly Ser Gly Ser Gly Thr Asp Phe Thr Leu Lys Ile
65 70 75 80

Ser Arg Val Glu Ala Glu Asp Leu Gly Val Tyr Tyr Cys Phe Gln Gly
85 90 95

Ser His Val Pro Pro Thr Phe Gly Gly Gly Thr Lys Leu Glu Ile Lys
100 105 110

Arg

<210> 97
<211> 113
<212> PRT
<213> Artificial Sequence

<220>
<223> light chain immunoglobulin variable region

<400> 97

Asp Val Leu Met Thr Gln Thr Pro Leu Ser Leu Pro Val Ser Leu Gly
1 5 10 15

Asp Gln Ala Ser Ile Ser Cys Arg Ser Ser Gln Thr Ile Val His Ser
20 25 30

Asn Gly Asn Thr Tyr Leu Glu Trp Tyr Leu Gln Lys Pro Gly Gln Ser
35 40 45

Pro Lys Leu Leu Ile Tyr Lys Val Thr Asn Arg Phe Ser Gly Val Pro
50 55 60

Asp Arg Phe Ser Gly Ser Gly Ser Gly Thr Asp Phe Thr Leu Lys Ile
65 70 75 80

Ser Arg Val Glu Ala Glu Asp Leu Gly Val Tyr Tyr Cys Phe Gln Gly
85 90 95

Thr His Ala Pro Tyr Thr Phe Gly Gly Gly Thr Lys Leu Glu Ile Lys
100 105 110

Arg

<210> 98
<211> 113
<212> PRT
<213> Artificial Sequence

<220>
<223> light chain immunoglobulin variable region

<400> 98

Asp Val Leu Met Thr Gln Thr Pro Leu Ser Leu Pro Val Ser Leu Gly
1 5 10 15

Asp Gln Ala Ser Ile Ser Cys Arg Ser Ser Gln Ser Ile Val His Ser
20 25 30

Asn Gly Asn Thr Tyr Leu Glu Trp Tyr Leu Gln Lys Pro Gly Gln Ser
35 40 45

Pro Lys Leu Leu Ile Tyr Ser Ile Ser Ser Arg Phe Ser Gly Val Pro
50 55 60

Asp Arg Phe Ser Gly Ser Gly Ser Gly Thr Asp Phe Thr Leu Lys Ile
65 70 75 80

Ser Arg Val Gln Ala Glu Asp Leu Gly Val Tyr Tyr Cys Phe Gln Gly
85 90 95

Ser His Val Pro Tyr Thr Phe Gly Gly Gly Thr Lys Leu Glu Ile Lys
100 105 110

Arg

<210> 99
<211> 14
<212> DNA
<213> Artificial Sequence

<220>
<223> primer

<400> 99
ctccgcttcc tttc 14

<210> 100
<211> 18
<212> DNA
<213> Artificial Sequence

<220>
<223> anti-sense

<400> 100
atctctccgc ttcctttc 18

<210> 101
<211> 18
<212> DNA
<213> Artificial Sequence

<220>
<223> anti-sense

<400> 101
atctctccgc ttcctttc 18

<210> 102

<211> 19
<212> DNA
<213> Artificial Sequence

<220>
<223> primer

<400> 102
aggagctcga ggcgttcag 19

<210> 103
<211> 22
<212> DNA
<213> Artificial Sequence

<220>
<223> primer

<400> 103
gtcttgggtg ggtagagcaa tc 22

<210> 104
<211> 21
<212> DNA
<213> Artificial Sequence

<220>
<223> primer

<400> 104
aggccaaacg tcaccgtccc c 21

<210> 105
<211> 109
<212> PRT
<213> Artificial Sequence

<220>
<223> A12 immunoglobulin light chain variable region

<400> 105

Ser Ser Glu Leu Thr Gln Asp Pro Ala Val Ser Val Ala Leu Gly Gln
1 5 10 15

Thr Val Arg Ile Thr Cys Gln Gly Asp Ser Leu Arg Ser Tyr Tyr Ala
20 25 30

Thr Trp Tyr Gln Gln Lys Pro Gly Gln Ala Pro Ile Leu Val Ile Tyr
35 40 45

Gly Glu Asn Lys Arg Pro Ser Gly Ile Pro Asp Arg Phe Ser Gly Ser
50 55 60

Ser Ser Gly Asn Thr Ala Ser Leu Thr Ile Thr Gly Ala Gln Ala Glu
65 70 75 80

Asp Glu Ala Asp Tyr Tyr Cys Lys Ser Arg Asp Gly Ser Gly Gln His
85 90 95

Leu Val Phe Gly Gly Gly Thr Lys Leu Thr Val Leu Gly
100 105